

A Discussion on the Building's Exterior Wall Insulation Technology and Energy-saving Materials

Haojiang Zhou*

China Academy of Building Research, Urumqi, Xinjiang 830054, China

ABSTRACT Hereby discussed on the most commonly used building's exterior insulation technology and energy-saving materials. Promote positive building's exterior wall technology, be sure to strengthen the development and utilization of new energy-saving materials, so that the EEB (Energy Efficiency Building) get implemented.

KEYWORDS

Energy-saving building
Insulation materials
New energy-saving technology

1. Introduction

EEB is the implementation of the national policy of environmental protection and energy conservation the main content is to implement the sustainable development of the national economy an important part. Ministry of Construction promulgated in 1995 a document relating to energy saving building "urban EEB implementation details" and so on, it is very clear and strict regulations, those who do not meet the energy efficiency standards of the project, cannot be approved for construction.

Under the guidance of such a series of energy efficiency policies, regulations, standards and enforcement provisions, residential construction deepening energy conservation, energy efficiency standards gradually improved, and the introduction of the development of many new energy-saving technologies and materials, and to promote in residential buildings use. But the current building energy levels, far lower than developed countries, energy consumption per unit area of the building is still three to five times the climate similar to developed countries. Building heating energy consumption of the northern cold regions local society as a whole accounted for more than 20% of energy consumption, besides the vast majority are based on thermal power and coal-fired boilers, despite the measures taken to improve air pollution remains serious to the environment pollution, it EEB or construction of the cen-

ture in an important issue.

In the building, the structure of the building envelope heat loss is large, the wall structure of the building envelope has accounted for a large share, for the Reform and Development of wall building wall energy saving technology is a building energy-saving technologies an important part of the development of the building's exterior insulation technology and energy-saving materials, is the main way of building energy efficiency a reality.

2. Building's exterior insulation technology

Energy-saving insulation wall construction technology, mainly divided into interior and exterior wall insulation and building exterior insulation types:

2.1. Interior and exterior wall insulation technology and its characteristics

Construction interior and exterior wall insulation inside the building's exterior is a structure of a plus insulation. Is a large-scale promotion of the building's exterior wall and technical approaches are: reinforced gypsum composite polystyrene insulation board, composite polystyrene insulation board polymer mortar; reinforced cement composite polystyrene insulation board and stick polystyrene interior wall plaster gray plaster and so on.

Advantage within their building's exterior wall technology are: construction speed, flexible operation, can guarantee the construction schedule, due to the application within the building's exterior insulation technology for a longer time, so the technology is mature, construction technology and inspection standards perfect. According to statistics, in 2001, the building's exterior wall construction, about 90 percent of the engineering application of the technology; its disadvantages are: multi-use area occupied by "thermal bridge problem is not easy to solve, prone to cracking, delayed construction speed, affected residents.

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*Corresponding author: China Academy of Building Research, Urumqi, Xinjiang 830054, China. E-mail: hao_jiang00z@163.com

The re-decoration, but also easy to destroy the interior and exterior wall insulation. Given the building's exterior wall technically unreasonable, it is bound to be building exterior insulation technology instead.

2.2. Building exterior insulation technology and its characteristics

Building exterior insulation is to promote a kind of energy-saving building insulation technology, interior and exterior wall insulation compared with its reasonable technology, has obvious advantages, the use of the same size, the same size and performance of insulation materials than building good interior and exterior insulation effect. Building exterior insulation technology applies not only to new construction projects, but also for old buildings, wide application range, high technical contents. Building exterior insulation on the outside of the main structure of the package, this can protect the main structure, thus extending the life of the building, effectively reducing the building structure "thermal bridge" to increase the available space of the building, while eliminating the condensation and improve the living comfort.

The relatively mature architectural exterior insulation technologies are:

(1) Plug-in building exterior insulation building exterior insulation material rock (ore) cotton board, glass wool Carpets, polystyrene foam board (referred to as polystyrene board, EPS, XPS), ceramic decorative stone-concrete composite polystyrene insulation board, steel mesh frame sandwich wall, of which polystyrene board due to have excellent physical properties and cheap cost, it has been in the world of building exterior insulation plug technology is widely used.

Plug-in technology is the use of adhesive mortar or special fasteners attached to the insulation material, hung on the building's exterior, then wiping cracking mortar, pressed into fiberglass mesh to form a protective layer, and finally add decoration surface.

(2) Watering disposable polystyrene board and the wall forming this technology is in the concrete block --- shear system, within the polystyrene board put in the construction template, on the outside of the wall is about to pour concrete subsequently watered, so, concrete pouring disposable polystyrene board forming a composite wall. The technology to solve the main problems of plug-in building insulation, the advantage is obvious. In view of the body and the external wall insulation once survived, so work efficiency increased, the duration is much shorter, and the safety of construction workers assured. In winter construction, polystyrene board insulation plays a role, can reduce the external envelope insulation measures. However, when instilled concrete must pay attention to uniform, continuous casting, otherwise due to the impact caused by the concrete side pressure polystyrene board deformation and dislocation in the form removal, after the impact of the

construction sequence.

(3) Polystyrene insulation slurry building exterior insulation to waste polystyrene (abbreviated EPS), processed broken into 0.5-4 mm particles as lightweight aggregate insulation mortar formulated. Less than inorganic materials, non-metallic thermal conductivity of less than metal materials.

This technology includes insulation layer, cracking the protective layer and barrier protection layer (or surface layer of impermeable layer cracking mortar combo), where ZL Adhesive Polystyrene insulation materials and technology, is a widely accepted building Current exterior insulation technology.

This construction technique is simple, but also reduce labor intensity and improve work efficiency, quality is not affected by differences in the structure, when the defective construction of the wall, the wall does not need repair leveling, direct Zhaobu with insulation slurry can avoid the other construction technology insulating plaster too thick because of leveling off phenomenon [1]. Meanwhile, the technology to solve the building exterior insulation projects, the use of harsh conditions caused by the interface layer hollowing easy to fall off, the surface layer easy to crack and other issues, in order to achieve a major breakthrough building exterior insulation technology. Insulation Compared with other building exterior, in the case to achieve the same insulation effect of its lower cost, thus reducing the cost of housing construction.

In addition, energy-saving insulation wall art, as well as the walls made of sandwich, will perlite, wood chips, glass wool, polystyrene foam and polyurethane foam (also available on-site foam) and the like filled sandwich, formed insulation.

3. Energy-saving building wall insulation materials

Energy-saving materials are thermal insulation materials. Insulating material refers to a material or composite material used in the building envelope or thermal equipment, heat transfer impedance, including both insulation materials, including cold material [2]. Significance of insulation material, both to meet the building space or thermal equipment thermal environment; the other is to save energy. With the increasing tensions within the worldwide energy saving insulation materials in terms of meaning obvious each day. Only in respect of the general population in terms of heating and air conditioning, through the use of thermal insulation envelope material, energy savings of 50% to 80% in the existing basis. Some countries will be considered as insulating material after coal, petroleum, natural gas, nuclear energy's fifth largest "energy".

3.1. Performance insulation material

The so-called adiabatic, is to maximize the impedance of heat transfer, and therefore requires a heat insulating material must have a large thermal resistance and small thermal

conductivity. Press the material point of view, generally less than the thermal conductivity of an organic polymer inorganic material, thermal conductivity non-metallic material less than metal.

The thermal conductivity of the gaseous material is less than the liquid substance, a liquid substance less than solid, it should be possible to use an organic polymer material or amorphous inorganic materials, which is advantageous for thermal insulation.

From the structure of the material point of view, when the apparent density of the material decreases, porosity increases, the material inside a closed porosity of a large number of small holes, the thermal conductivity of the material is relatively small. For foam products, to meet the needs of thermal insulation materials, its best apparent density of 16-40 kg / m³. Due to the porosity of the material in a humid environment pollution is inevitable to water, and thermal conductivity of water (0.5815 W/m.K) than the still air of the thermal conductivity (0.0233 W/m.K) much larger, so as heat insulation materials, moisture absorption material itself to be as low as possible.

In addition, thermal insulation material must also be resistant to some of the impact load, has the use of the environment consistent with mechanical strength, the bond performance is better, but also a small shrinkage and acclimatize durability.

3.2. Conventional thermal insulation materials

3.2.1. Commonly used thermal insulation material

Properties to meet the above requirements and performance for the building's exterior wall insulation energy-saving materials are: polystyrene foam board (EPS and XPS), rock (ore) cotton board, glass wool carpets, as well as ultra-light particles of polystyrene insulation materials such as pulp [3]. All of the above materials have common features are there a large number of closed pores within the material, its apparent density are small (which is also used as thermal insulation materials are essential). Their performance compared in Table 1.

3.2.2. Conventional thermal insulation materials

Rock (ore) cotton: sometimes collectively referred to as mineral wool and cotton, they all belong to the inorganic material. Rock (ore) cotton does not burn, lower prices, to meet the thermal insulation properties, it is also possible to

have a certain insulation effect, but the quality of the merits vary greatly, good thermal insulation properties of low density, tensile strength also low, relatively poor durability.

Glass wool: the rock (ore) cotton in the performance there are many similarities, but it feels good to rock (ore) cotton, can improve working conditions for workers, the price is higher than the rock (ore) cotton.

Styrofoam: it polystyrene fat as the main raw material, made of foam blowing agent inside the closed cells have countless material, apparent density, thermal conductivity, low water absorption, sound insulation good, high mechanical strength, and high dimensional accuracy, uniform structure, so the building's exterior wall in a high share.

Hard polyester foam: a very excellent insulation properties, low thermal conductivity coefficient (0.025 W/m².k), It is not comparable to other materials. At the same time, it also has superior moisture resistant properties, reducing the project cost. However, due to its high price, and flammable, thus limiting the use of it.

Polystyrene insulation slurry: the powder particles of polystyrene insulation material and packaging respectively, according to the ratio of the composition. The material to facilitate the construction, good insulation properties, but high water absorption than other materials, must be added to make the use of crack waterproof layer.

4. Conclusion

At present, China has developed rapidly building's exterior insulation technology, energy-saving focus. Development and innovation in energy-saving building materials external wall insulation technology are inextricably linked, building energy efficiency must be based on the premise of the development of new energy-saving materials, must have sufficient thermal insulation material foundation. Development of energy-saving materials and must be combined with the building's exterior insulation technology, can really play a role. It is precisely because innovation energy-saving materials, building wall insulation technology superiority was growing people's attention. To this end, to promote the building facades, insulation technology, to strengthen the development and utilization of new energy-saving materials, thus truly building energy efficiency, for the construction industry to contribute to the national energy savings also provide a source of strength.

Table 1. Main properties of materials commonly used in thermal insulation.

Material Name	Apparent density (kg/ m ³)	Maximum use temperature (°c)	Compressive strength (MPa)	Thermal Conductivity (W/m.K)	Water absorption (%)
Rock (ore) cotton insulation board	80 ~ 150	-268 ~ 350	-	0.047 ~ 0.052	-
Glass wool felt	40 ~ 60	-120 ~ 400	-	≤ 0.035	-
Styrofoam plates	16 ~ 30	-80 ~ 75	0.12 ~ 0.18	0.033 ~ 0.044	< 0.1
Polystyrene insulation slurry	≤ 220	-50 ~ 75	≥ 0.01	< 0.07	-

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