FS019
C & C
EDITION

BOSTIK

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EDUCATION

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RESULTS
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OUR MISSION

BOSTIK Academy

SUPPORTED BY

Thermal conductivity

FACTSHEET

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GLOBAL LEADER IN ADHESIVE TECHNOLOGIES

Bostik is one of the largest adhesive and sealant companies. Worldwide, we employ some 6,000 people in 50 countries across five continents. Our customers come from diverse markets, most notably the industrial manufacturing, construction and consumer sectors.

SMART INNOVATIONS

Our smart identity is underpinned by innovation. We pursue innovation vigorously, applying the latest technological advances to developing 'smart' adhesives. Our archives are laden with examples of Bostik technologies that have disrupted markets - from potato starch-based wallpaper paste to elastic attachment adhesive for diapers.

Today, our commitment to innovation is as strong as ever. We innovate with our customers through a global R&D network, comprising three international Smart Technology Centres and 11 regional centres. And we differentiate our business through this investment. That's why in 2014, 15% of Bostik sales came from products launched in the previous three years.

Thermal conductivity

GENERAL INFORMATION

Bostik manufactures and offer a wide range of high quality sealing and bonding products. The polyurethane foams are part of our portfolio. Polyurethane foams are most often seen as commodities and low end products. Although this market perception, polyurethane foams can be seen as high end solutions for filling, insulating, fire protection, energy efficiency and exceptional strong adhesives.

THERMAL CONDUCTIVITY

One of the technical specifications and benefit of polyurethane foams is de ability of insulating the construction. At the technical data sheets a phrase 'thermal conductivity' is declared in W/mK. But what is thermal conductivity and what can we do with it?

Thermal conductivity, denoted by λ, refers to the intrinsic ability of a material to transfer or conduct heat. It is one of the three methods of heat transfer, the other two being convection and radiation. Heat moves along a temperature gradient, from an area of high temperature and high molecular energy to an area with a lower temperature and lower molecular energy. This transfer will continue until thermal equilibrium is reached. The rate at which heat is transferred is dependent upon the magnitude of the temperature gradient, and the specific thermal characteristics of the material.

FEICA TEST METHOD TM 1020:2017

Bostik is a FEICA member as global polyurethane foam manufacture and supplier. As FEICA member we have to fulfil the determined test methods as set by FEICA and their members to offer maximum transparency to the market. One of the test methods is the TM 1020:2017 with the title Determination of the long term Thermal Conductivity of an OCF Canister Foam. This method describes how to determine the long term thermal conductivity of a cured OCF foam, dispensed from a pressurised can, with a sample subjected to accelerated ageing procedure.

Within the FEICA TM 1020:2017 the preparation and test procedure has been described in detail and must be executed accordingly the EN 12667.

One of the most important characteristics of polyurethane foam is its very good thermal insulation. When OCF foam is used as sealing and insulation of windows and external doors; low insulation value is of great importance.

CALCULATING WITH THERMAL CONDUCTIVITY

As mentioned at the front page, thermal conductivity, denoted by λ, refers to the intrinsic ability of a material to transfer or conduct heat.

The lambda value indicates the thermal conductivity of a material. It is expressed in W/mK. The higher the value, the better the heat is conducted and thus the less the material insulates. We can use the thermal conductivity and the thickness of the material to calculate the heat resistance of the structure. The heat resistance or also thermal resistance is a heat property and a measurement of a temperature difference by which an object or material resists a heat flow.

So to understand thermal resistance better and to place in in perspective of thermal resistance, we can calculate the required joint depth of a polyurethane foam to play a significant role for instance in energy efficient houses and buildings.

The formula of thermal resistance is as follow:

$$R = d/\lambda$$

R = heat resistance in m2 K/W
d = thickness of the material in m
λ = thermal conductivity in W/mK

EXAMPLES OF THERMAL CONDUCTIVITY

Concrete λ = 1.30 W/mK
Brick λ = 0.81 W/mK
Wood λ = 0.13 W/m.K
Polyurethane foam λ = 0.030 W/m.K
Polystyrene foam λ = 0.026 W/m.K
Dry air λ = 0.025 W/m.K

CALCULATIONS

- Wood with a thickness of 10 cm (0.10 m) and a λ-value of 0.13 gives an R-value of 0.8 m^2K/W (0.10/0.13)
- Polyurethane foam with a thickness of 10 cm (0.10 m) and a λ-value of 0.03 gives an R-value of 3.3 m^2K/W (0.10/0.03)

RESUME

From a technical performance for polyurethane foams, the lower the value of the thermal conductivity, the higher the resistance against temperature loss, which is in benefit for energy efficient houses and building.