

Polyolefin foams provide attractive solutions for thermal insulation of pipes in buildings

Even as the world takes the path towards creation of more energy from renewable resources, the need for us to use less energy is our key priority. Wherever our energy comes from, we pay a price for it. It makes sense to hold on to what we have.

The building and construction industry has considerable potential to help save thermal energy. If we can devise and implement better ways to insulate houses, offices, factories, and pipework systems against heat loss (and refrigeration equipment against heat gain), then we can make a considerable contribution to conservation of energy – and a reduction in our gas and electricity bills.

All around the world, regulations covering thermal insulation performance and energy efficiency in building and construction are tightening. As a result, we are witnessing an increase in the use of high quality insulating products in the overall building stock and an increase in the amount of insulation needed per building.

Energy saving measures need to continue

In the USA, for example, building energy codes have already helped cut energy consumption by more than 30% over the last ten years, providing savings of over \$60 billion for families and businesses – and the trend is set to continue. According to the U.S. Department of Energy, energy codes will save homes and businesses \$126 billion between 2012 and 2040. In China, as of early 2014, building energy codes required energy savings of 65% compared to 1980 buildings. The European Commission says that by improving the energy efficiency of buildings, total energy consumption in the European Union could be reduced by 5-6%.

In many homes, insulation is the most practical and cost effective way to make a house more energy efficient, keeping it cooler in summer and

warmer in winter. Good insulation can save up to 40% in heating and cooling bills.

There are three main areas where heat escapes from houses and buildings. Firstly, there is the structure – the walls, roof, windows, and foundations. A second area is ventilation, where heat loss depends on the house volume. Finally, there are the systems for heating the water and for air conditioning, where heat or cold can be lost during generation, storage, and distribution. It is important not to forget elements such as pipework for hot and cold water. Insulation of pipework in industry is even more important.

SABIC solutions in polystyrene and polyethylene

When we think of building insulation, we tend to think of foam. In fact, polymer foams have a 55% share of the market for insulation materials in building and construction. They are followed by glass wool (25%) and stone wool (20%). In Asia, polymer foams are especially dominant, with a market share of some 70%.

Foams for the thermal insulation of buildings are based on three families of polymers: polystyrenes (EPS bead foam and XPS extruded foam), polyurethanes, and polyolefins.

Polystyrene foam, which SABIC supplies in the MEA (Middle East, Africa) region, is by far the most preferred solution for cavity walls and concrete floor insulation, due principally to its low thermal conductivity. This is indicated by the k-value (also known as the lambda value), which is between 0.030 and 0.035 W/m·K. In addition, it has good structural performance, while the use of special additives can provide high fire resistance.

Thanks to their flexibility and good thermal insulation properties (k-value is between 0.034 and 0.038 W/m·K), polyolefin foams are widely used in many building and construction applications such as floor underlay, aluminum-laminated wall and roof insulation, sealing, ground cushioning

and especially thermal pipe insulation. SABIC is an important supplier of various polyolefins for insulation foams globally.



LDPE foam for floor underlayment

Pipe insulation holds much promise

The potential for energy saving through pipe insulation has received rather less attention than structural insulation. There are often numerous components in heat distribution pipe systems that are left inadequately insulated or not insulated at all, leading to unnoticed and unrecognized thermal energy wastage. SABIC believes numerous new opportunities still exist for energy savings by insulating pipe components in buildings.

As well as saving energy, pipe insulation can also help with condensation control, noise reduction, and protection against pipe fracture caused by the water inside freezing and expanding.

One study calculated that fuel savings achievable by insulating these pipe components could amount to 8% of the total heating fuel bill over the course of a year. This potential is easy to realize. Pipe insulation is a relatively simple and cost effective solution for old and new houses and buildings. When it comes to residential plumbing insulation for example, this is a low-cost DIY solution that will start paying rewards immediately.



Pipe insulation and profiles

New polyolefin solutions for pipes

In industrial applications and commercial buildings, mineral wool and glass wool are common pipe insulation materials, but there is a trend to replace them where possible with polymeric foam materials. Polymeric foams have better thermal insulation performance, ease of installation, higher water vapor resistance, superior mechanical properties, and superior health and safety aspects. The use of NBR and EPDM rubber foams, together with LDPE foams, is growing rapidly, especially for cold insulation. All three products have similar thermal insulation characteristics, but SABIC believes LDPE-based foams have the greatest potential for growth.

In Europe, SABIC already has a strong position with LDPE-based pipe insulation for hot water and heating systems, and intends to grow this solution globally. It believes LDPE is the best solution, thanks its optimum balance between insulation value, costs and ease of installation. LDPE flexible closed-cell pipe insulation effectively reduces heat loss in hot water plumbing and heat gain on cold and chilled water plumbing systems. It is used in residential plumbing and district heating, and is recommended for use up to 95°C. LDPE pipe insulation systems are easy to install and have good thermal conductivity properties.



LDPE foam pipe insulation

Enhanced LDPE for low-temperature applications

For cold temperature insulation of HVAC units, additional material properties are required, mainly related to water vapor transmission, low temperature elasticity and other mechanical properties. Today, EPDM and NBR are the dominant materials used in the market. But LDPE foam is much less dense than its rivals, and considerably less costly. EPDM, for example, is four times as expensive. Enhanced LDPE foam solutions combined with an impermeable skin layer have a vapor transmission barrier comparable to that of NBR and EPDM.

SABIC is expanding its portfolio of LDPE foam solutions through new developments involving blends of LDPE with thermoplastic polyolefin elastomers (POEs) and plastomers (POPs). The company offers POEs with the brand name SABIC® FORTIFY™, while SABIC® COHERE™ is the name used for its POPs. These novel blends improve mechanical properties such as low temperature flexibility, puncture and tear resistance.

SABIC's enhanced LDPE foam solutions score highly in terms of recyclability and corrosion-resistance pipe systems owing to the fact that PE foam, which is physically foamed, has fewer additives that can potentially cause corrosion.

Foam Innovation Center – where new ideas take shape

SABIC has created considerable interest in the development of blends of LDPE with POE and POP. Customers who participated in pilot line trials held in early 2017 at SABIC's new Foam Innovation Center (FIC) in the Netherlands were particularly impressed by the much better flexibility and tear resistance obtained using the blends, compared to conventional LDPE foam. These two properties are essential requirements for easier and quicker installation of pipe insulation.

The FIC is equipped with state-of-the-art foam processing machinery, as well as advanced foam analytical equipment, operated by dedicated foam experts, enabling SABIC to carry out developments on new foam solutions, technology innovations and collaborative projects with partners across the value chain. This will help them make better foams and foamed products, even more cost-effectively and decrease time-to-market for new developments.

Conclusion: a call for collaboration in pipe insulation

SABIC has numerous solutions for thermal pipe insulation, based on different polymers in its broad product portfolio, putting it in a leading position in the global market. The company believes that polyolefin foams have considerable potential for growth in the pipe insulation market, especially thanks to breakthrough developments in polymer technology that put the portfolio in a better position versus rival materials. These developments demonstrate SABIC's commitment to finding solutions to conserve energy efficiently and cost-effectively.

SABIC encourages collaboration with players along the polymer foam insulation production, conversion and installation chain, to ensure that the best materials and technologies are applied in the most effective ways possible, to develop even better innovative solutions that address the future needs of the foam thermal insulation market.

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