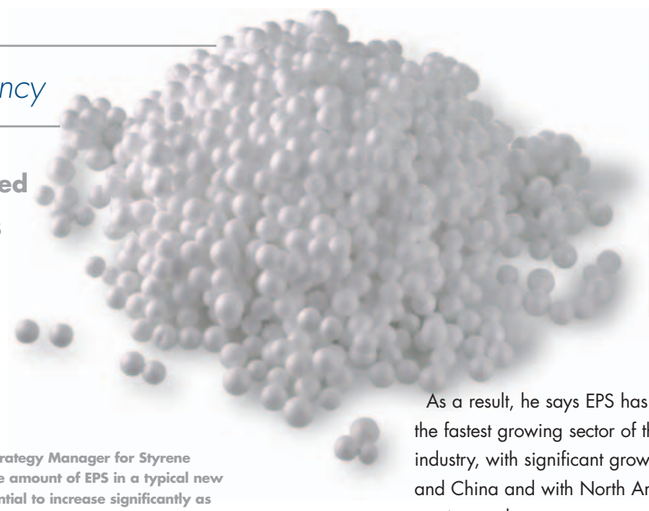
Expanding role for insulation

New EPS building insulation applications include structural insulated panels (left) and insulating concrete forming (below).

EPS foam's increasing application in building energy efficiency



Rising energy prices and concerns about security of supply, combined with the threat of global climate change, have placed greater focus on the energy efficiency of buildings. This has led to a surge in the use of expanded polystyrene (EPS) foam, both as an effective form of insulation and as a complete, sustainable construction solution.

Buildings are one of the largest end users of energy. According to the World Business Council for Sustainable Development (WBCSD) they are responsible for at least 40% of energy use in most countries, and the overall figure is rising as construction booms in places like China and India.

As consumers struggle with higher energy costs and governments address the effects of carbon emissions on climate change, there has been sharper focus on improving the energy efficiency of buildings.

With the construction industry under pressure to design and build more energy efficient, more sustainable homes, and faced with increasingly tighter building specifications and standards, thermal design has become a high priority.

"Building insulation is one of the biggest mitigating factors against energy use and climate change," explains Ed Schouten, Strategy Manager for Styrene Monomer. "Buildings have long life cycles, so if poorly insulated they can have a significant effect on the environment."

He says that in the key developed markets of Europe and North America, the thermal performance of expanded polystyrene (EPS) foam, produced by the polymerisation of styrene monomer (see box), has led to its emergence as one of the most preferred insulation solutions.

"EPS is among the most versatile, energy efficient, and cost effective insulators available, delivering the high, stable R-values (resistance to heat flow) demanded by the construction industry. Its thermal performance can help to significantly lower heating or cooling costs – savings that add up over the life of the structure.

"Independent studies show that the energy used to produce EPS insulation for a typical home is regained after only one year through the energy saved."

The Shell Group is the largest global producer of styrene monomer (SM) – the raw material for EPS - with production facilities in Canada, The Netherlands, Saudi Arabia, Singapore and China.

ATTRACTIVE QUALITIES

As well as having excellent thermal performance, EPS has a number of other qualities that make it attractive to the construction industry. It is light and easy to transport, and can be cut, shaped and moulded into virtually any shape. It can be used as a cavity fill material in bead form or more commonly as moulded panels.

"Its versatility means it can also be used in almost every part of a building – from foundations to walls, floors and the roof," says Schouten. "The amount of EPS used in a typical new home also has the potential to increase significantly as tougher building regulations increasingly require thicker insulation."

Ed Schouten, Strategy Manager for Styrene Monomer - "the amount of EPS in a typical new home has potential to increase significantly as tougher regulations require thicker insulation".

As a result, he says EPS has become the fastest growing sector of the styrenics industry, with significant growth in Europe and China and with North America also starting to show a strong upward trend.

It is only recently, however, that builders and architects have come to fully appreciate its versatility and design potential. "Because of the current demand there has been a lot of innovation within the EPS industry recently," says Schouten.

EPS building applications have grown significantly and increasingly involve complete structural solutions. The use of hollow EPS blocks filled with concrete (insulating concrete forming or ICF systems), for instance, has become an established building method.

More recently, EPS has been used in the development of advanced structural insulated panels (SIPs), sandwiched between sheets of timber, allowing complete buildings to be erected quickly and with limited skilled labour.

Although the EPS insulation market in North America is not yet as well developed (only about 300 kta of EPS goes to construction compared to over 1,000 kta in Europe) it is expected to grow as higher energy prices impact consumers and energy efficiency/CO_2 reduction move up the political agenda.

One styrene customer that has seen evidence of this trend is PFB Corporation of Calgary, Canada. PFB is an integrated manufacturer of EPS products, with its own polymerization and foam-making facilities. It has been making EPS insulation products for 40 years and has been at the forefront of developing new construction solutions for the North American market.

Alan Smith, Chairman and CEO, says: "Due to the rising energy costs there has been a concerted effort to improve the insulation standards of residential and commercial buildings in North America. Building codes now include stringent targets for energy efficiency, but demand has been driven as much by consumers looking to conserve energy."

He says the company's EPS business has doubled in size in the last five years, thanks to the development of innovative building solutions such as ICF and SIPs. "Increasingly, EPS is becoming the material of choice for insulation applications and has developed a larger market share than other competing materials. Our order book is the highest it's ever been in our history."

The innovation of EPS producers such as PFB provides architects, designers, planners and builders with more options to create sustainable building designs that help to reduce both building energy costs and greenhouse gas (GHG) emissions.

The WBCSD estimates that global carbon emissions could be reduced by 715 million tons by 2010 through simply improving the energy efficiency in buildings and appliances. This would be equivalent to 27% of the projected increase in GHG emissions to that date.

For more information visit:
shell.com/chemicals/styrene

ABOUT EPS FOAM

Expanded polystyrene foam is produced by first polymerising styrene monomer in a suspension of water, to create small spherical beads of polymer. During the polymerisation process a blowing agent is introduced which impregnates the beads.

When the beads are re-heated, the blowing agent causes them to expand by 12-15 times their original size - creating a honeycomb of closed cells. These expanded beads can be used as they are but more commonly are fused together in a mould to form an odourless, inert and non-toxic foam.

As well as being extremely thermally efficient, EPS foam is light, strong and weather-resistant. Its physical properties do not deteriorate with age.