AUSTRALIAN MODERN BUILDING ALLIANCE

Safe and sustainable construction with polymers

The benefits of polymers for Australia's built environment

This information sheet explains how polymer-based construction products create modern buildings that are durable, safe, sustainable and energy efficient.

Polymers in the construction industry

Polymers form the basis of many construction materials that are integral to modern buildings such as foams, paints, sealants, rubbers and plastics.

These materials cover a broad range of products and applications for building interiors and exteriors including insulation, piping, flooring, wiring, window installation, solar modules, ventilation systems, awnings, painting, tiling and landscaping.

The challenge

Whether in the construction, use or end-of-life phase, buildings consume vast volumes of energy equating to large volumes of greenhouse gases (GHG).

In Australia, our buildings account for 19 per cent of total energy used and 18 per cent of our total direct GHG emissions.[1] This figure would be closer to 40 per cent of total GHG emissions (in line with the global building and construction sector) if indirect emissions were also included.[2]

According to the Australian Sustainable Built Environment Council (ASBEC), buildings in Australia constructed after 2019 could make up more than half of the country's total building stock by 2050.[3] The IEA recommends strengthening construction codes to address the energy efficiency of new buildings and those requiring major retrofits as an immediate priority.[2]

Constructing and renovating buildings with sustainability and energy efficiency in mind is vital to our low-carbon future, particularly at a time when Australia's energy costs and demands are increasing.

The performance and durability of construction products – particularly insulation – is key to creating more energy efficient buildings.

Products should be long lasting, require low maintenance or ongoing energy demand, and ensure structural and thermal performance throughout their lifetime.

A sustainable solution

Polymer-based construction materials are a key part of a sustainable, energy efficient solution because they have a range of advantages over alternative materials for meeting energy efficiency requirements.

These materials are durable, easy to install, weather resistant (less prone to corrosion) and high performing. Their durability and long-term aging properties mean they require minimal additional resources to support them during their life cycle.

While building materials generally last 30 to 50 years, polymer-based materials such as PVC pipes can last longer. This removes the need for replacement products – conserving resources and reducing waste.

The durability of polymer-based materials also means they can be recovered for future use, with manufacturers working to further extend their life cycle, energy efficiency and lifetime energy savings.

This includes moving away from the simple re-use of products to more diverse recycling solutions such as chemical recycling and energy recovery.

Together, the flexibility, durability, lightness and long-term performance make polymer-based materials a sustainable choice for building and construction.

Insulating for efficiency

The majority of energy in Australia is used by the transport, manufacturing, mining and building and construction sectors.[1] Within the housing sector, heating and cooling buildings makes up 40 per cent of total energy consumption.[4,5]

Because heating and cooling of buildings is such an important factor in managing energy use (and GHG emissions), better insulation of walls, roofs, ceilings and floors can lead to significantly lower emissions through greater energy efficiency.

All insulation materials will play a role in the transition to a low-carbon economy. However, polymer-based materials such as rigid polyurethane insulation (PUR), polyisocyanurate insulation (PIR) and phenolic foam are unique in their insulation properties and the benefits they offer buildings.

PUR and PIR are highly effective against cold and heat – providing more comfortable living and working spaces and also allowing consumers to save money and reduce energy and emissions from heating and cooling.

PUR and PIR also possess some of the lowest thermal conductivity measurements of commonly available insulants – taking up less physical space (thinner insulation) than alternatives, without sacrificing performance.[6] As a result, building designers can make better use of space and light.

For example, the chemical structure of polyurethanes renders them highly adaptable and available in many forms – making them extremely versatile as energy efficient insulation solutions in new and old buildings.

Compared with other insulation materials at the same thickness, polymer-based insulation materials such as PUR and PIR can also achieve greater greenhouse gas and total energy savings.

For example, PUR insulation can halve the energy usage of an un-insulated brick house, and can save 25 per cent more than other commonly used insulation materials.[7]

Polymer-based materials can be used safely when installed correctly in line with manufacturer guidelines and the National Construction Code (NCC).

AMBA supports the use of polymer-based materials such as PUR and PIR that have passed large-scale fire tests assessing the performance of the full building system rather than individual components (see the Safety section for more information).

A lifetime of saving energy

Polyurethane insulation materials save more energy during their lifetime than are used in their production – something common to polymer-based materials in building and construction.

Plastics Europe estimates that in an average house, plastic insulation products recover the energy used to manufacture them in only one year.[8]

This energy recovery and saving continues for the lifetime of the product; in total, these materials can save more than 200 times the energy used in their production.[9]

Polymer-based insulation materials are also highly cost-effective when rated on the cost per tonne of carbon dioxide saved.

Key benefits

Taken together, the durability, flexibility, performance, reliability and cost-effectiveness of polymer-based construction materials such as PUR and PIR insulation make them an essential part of the sustainable construction solution.

They can help to reduce the carbon footprint and environmental impact of our buildings, and promote a circular economy in which we reduce total materials used, prolong their use and eventually recycle or re-use them.

Safety is the priority

AMBA's priority is to foster a safe built environment for Australians, with our focus being on ensuring our buildings are designed and constructed to protect the people that construct, live and work in them.

Integral to this is support for and compliance with the NCC and the safety of the systems in which polymer-based materials are used.

The safety and integrity of our buildings is a joint responsibility, and all stakeholders in the building and construction value chains, including regulators, have key roles to play.

Recent events locally and internationally have increased attention on how to improve the fire safety of Australian buildings.

A fire-safe building requires approved construction materials that have been installed correctly and are maintained consistently and in accordance with manufacturer guidelines, as well as all national and local building and construction codes and standards.

AMBA is committed to working with industry, government, authorities and fire safety professionals to share knowledge and best practice in further advancing the safety of Australian buildings.

Fire safety testing

We support the NCC's focus on performance-based solutions, and large-scale fire testing of facades in line with Verification Method (CV3) for meeting fire safety performance requirements for fire spread.

This includes:

- AS 5113: Fire Propagation Testing and Classification of External Walls of Buildings, and
- AS 5637 for the assessment of internal wall and ceiling linings in commercial buildings.

Together, these testing and verification methods:

- encourage product innovations, which drive energy efficiency
- allow product manufacturers to meet or exceed the performance provisions of the NCC
- enable building designers to meet multiple performance requirements, such as weight and thermal insulation properties, in a more cost-effective way.

Importantly, they do so in a system where components work together to meet the stringent safety requirements of a building's inhabitants.

The fire performance of a facade system cannot be predicted purely based on small-scale fire tests of individual components.

Rather, it depends on the interaction of all components and the compliant installation of these systems in accordance with all local and national codes and standards.

References

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