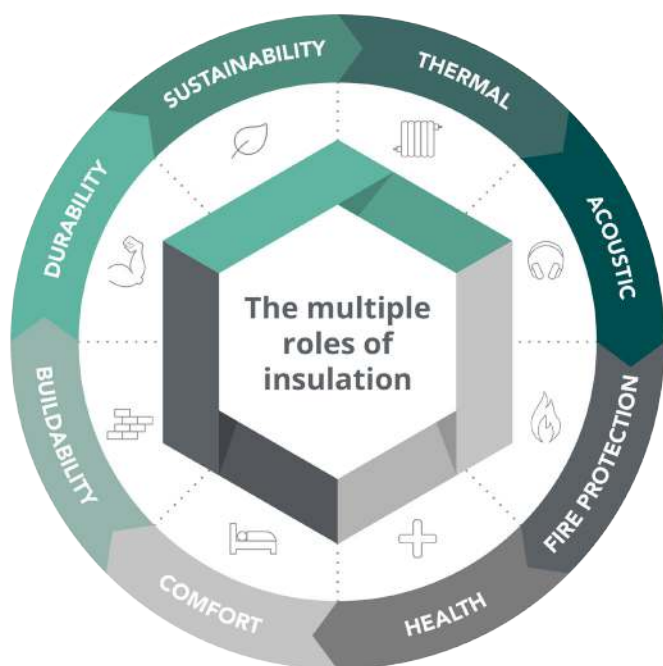


THE MULTIPLE ROLES OF INSULATION

ASBP Briefing Paper | December 2018

This paper is part of a planned series of ASBP industry briefing papers aimed at generating a greater understanding of the roles and capabilities of natural fibre insulation (NFI). In doing this, we hope to enable industry to deliver better buildings designed to take advantage of the significant building performance benefits of NFIs.

Most of us recognise the importance of insulation in preventing heat loss and saving energy within the building but few of us connect insulation with other aspects of building performance. In this briefing note, we aim to highlight the many roles insulation plays.



The multiple roles of insulation. ('Protexion' graphic courtesy of Ecomerchant/STEICO)

Insulation can account for more than 50% of the volume of the building fabric so it's important to appreciate what insulation is capable of doing. In fact, insulation and NFIs in particular play a significant role in at least eight aspects of a building's performance.

Thermal Performance

When we consider thermal performance we often focus on the energy efficiency of a given thickness of material (thermal conductivity). Lightweight materials that appear to save a lot of energy when used in minimal thicknesses are often the preferred choice. But in many cases this is not the best solution.

Thermal performance is not just about reducing heat loss. Controlling the rate and pattern of heat loss as well as heat gain during the daily weather cycle and in response to the seasons is equally important.

It is a common misconception that only "space age" materials can be used to achieve excellent energy efficiency. Natural fibre insulation is capable of achieving the highest levels of energy efficiency. The only difference with NFI is the larger depth required to achieve high performance levels. As we go on to discuss, this greater depth of insulation rather than being a disadvantage, provides many advantages.

The greater thickness and density of natural fibre insulation gives the building fabric greater thermal mass. This means as well as being energy efficient, NFIs help temper heat loss and gain on a daily and seasonal basis creating a substantially more comfortable living environment. The thicker layer of insulation also improves moisture buffering potential and acoustic performance.

Sound

The acoustics within our living spaces has a significant bearing on our quality of life and is one area that considered use of NFIs can greatly enhance.

Many of us do not draw a connection between thermal insulation materials and acoustic insulation materials, instead believing that acoustic insulation is a specialist material that needs to be treated separately to thermal insulation.

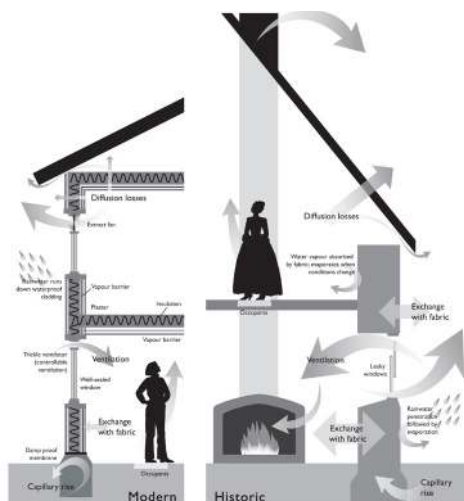
In the case of man-made materials, this is often the case. However, in most cases, NFIs act as both a thermal and acoustic insulator.

The excellent acoustic performance of NFIs is down to their relatively high density. The non-uniform size, shape, texture of the fibres themselves helps the insulation absorb sound across a wide range of frequencies.

Durability

Building products should be durable for their intended life whilst providing sustainable end of life options. At the same time, they should contribute to the durability of the building fabric as a whole. NFIs offer all of these.

When installed within the building, NFIs are structurally and chemically stable which ensures their performance doesn't diminish over time. This means that a fabric designed around NFIs will perform as designed throughout its life.



Control of moisture within building fabric is particularly important in modern airtight buildings. (Robyn Pender, *English Heritage*)

Moisture and humidity is one of the most significant factors influencing durability. Buildings designed around NFIs will be more capable of combating the destructive nature of excessive humidity and moisture within the building. They do this by allowing a safe passage for moisture whilst at the same time binding and releasing moisture in a way that minimises its harmfulness.

Due to their inherent ability to bind and release water molecules, NFIs act as a humidity buffer. This helps protect structural timber elements from moisture, preventing the accumulation of harmful water and providing a stable fabric. This is particularly appropriate in the more damp and humid climate of the British Isles

Sustainability

In a world where almost anything can be made to look sustainable it is more important than ever to give careful consideration to the materials and products we use.

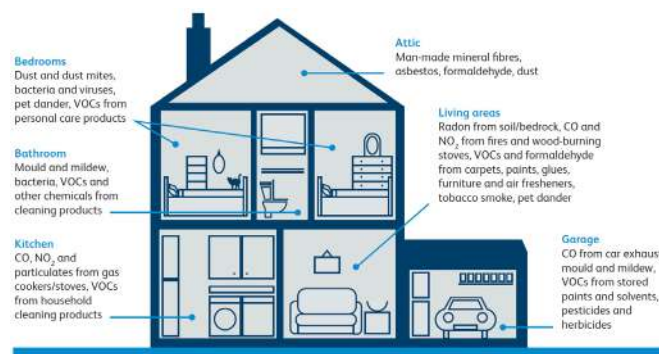
Just because insulation saves energy in operation, it does not mean all insulation types are inherently sustainable. The impact of insulation manufacture and use on our resources, environment and health, to name a few, all have a bearing on sustainability.

Natural fibres have the capacity to be the most sustainable raw materials in construction. They absorb carbon dioxide during growth and lock it up in the fibre during service. Many fibres used in NFI comprise waste fibres or lower value fibres that would otherwise go to waste. As building standards require ever greater levels of thermal insulation, the environmental impact of the materials we use, in particular insulation, cannot be underestimated.

Indoor Air Quality

We spend up to 90% of our lives in buildings so creating and maintaining a healthy and comfortable indoor environment is important, however complex. Effective ventilation is critical to maintaining healthy indoor air quality, as is designing out as many sources of toxins as possible. It is important to understand the impact of the materials and products we are exposed to in our everyday lives. Of these, building products and materials represent a significant proportion.

According to the Royal College of Physicians, the potential impacts of poor indoor air quality include asthma, chronic obstructive pulmonary disease (COPD), respiratory irritation, effects on the heart, and cancer, as well as non-specific symptoms such as headache, tiredness and loss of concentration.



Sources and types of indoor pollution in homes. (Every breath we take: the lifelong impact of air pollution. RCP, 2016)

NFIs generate low levels of VOCs helping control pollutants at source. This is important not only for the homeowner, but also the installer. What's more, by helping control indoor moisture levels, NFIs can help maintain humidity within a healthy range.

Fire

Because insulation occupies a large proportion of the building envelope it has the potential to play an active role in the development of fires within buildings. As such it is important that insulation is installed in line with current Building Regulations.

It is most important that insulation doesn't play a role in the developmental stages of a fire. In materials such as wood and wool this is achieved thanks to their natural charring behaviour that inhibits flame spread and retards the penetration of fire ingress into a building element

NFIs pass fire tests to ensure they are fit for purpose. Tests include Euro Class fire ratings or British Standards such as BS476 or BS5803. Inorganic mineral based fire retardants are used where necessary.

What's more, compared to many synthetic insulation materials, NFIs emit much lower levels of noxious gases when exposed to fire.

Buildability

NFI products and systems are designed to improve buildability. Because many NFIs are a relatively new technology, their design has incorporated leading edge thinking that maximises all aspects of insulation performance and ease of use.



Installation of external woodfibre insulation. (Houlston Manor, Shropshire. Image courtesy of Lime Green Products)

For example, the use of specially designed tongue and groove profiles for NFI board products, specially designed injection machinery for loose fill NFIs. NFIs are also an essential component of traditional building where they can be used safely and easily with minimal protection. They are also more compatible with traditional building materials.

NFIs can be used as a direct replacement for mineral or petrochemical insulation in standard applications without the need for significant redesign.

Health & Comfort

We spend most of our lives indoors, so it is no surprise that the buildings we occupy and the things they are made from can have a significant bearing on our health and comfort.

All the aspects we have covered here have a bearing on our lives from healthy and comfortable heat, sound and air, to safe use and construction and consistent performance. These are all aspects that insulation influences and in which NFIs can benefit us.

Conclusion

In terms of the volume it occupies, insulation is one of the most significant components of the building fabric. As such it has the ability to significantly influence the performance of the building fabric that goes beyond energy efficiency and heat loss.

When we consider insulation in all its functions, NFIs have unquestionably the most effective all round performance.

This paper has been peer-reviewed and is supported by members of the ASBP's Natural Fibre Insulation Group.

Through collaborative actions we aim to better communicate the benefits of natural fibre insulation products and systems.

Find out more at asbp.org.uk/natural-fibre-insulation.

**NATURAL FIBRE
INSULATION GROUP**