Going natural means more than just insulation

Historically natural insulation products have struggled to enter the mainstream of the built environment due to the incorrect perception that they cannot compete in the area of performance or cost.

WHEN WE CONSIDER the array of benefits which natural insulation provides the reality is that natural materials outperform many man made insulation products in both these categories.

Until relatively recently it was solely the superior ecological natural characteristics which separated natural insulation products from the various other forms of man made synthetic based insulation products currently available on the market.

The introduction of the Building Energy Rating in Ireland and more stringent requirements for higher levels of quality insulation has lead to a significant influx of a vast array of alternative insulation materials.

As the market for natural insulation has rapidly expanded over the recent past, more and more designers, specifiers and dwellers are appreciating the vast array of superior technical properties which natural insulation inherently offers. The most common forms of natural insulation used on the market today can be categorised as wood fibre, hemp and cellulose based materials to name but a few. Each of these materials has a unique combination of key characteristics which helps to create a healthier, comfortable, energy efficient, durable construction. Natural insulation materials do not underperform when compared to man made synthetic insulation. They are generally far better materials in terms of performance, and in addition are renewable and sustainable materials which meet key sustainability criteria.

Natural insulation materials feature an array of characteristics which, when used correctly, can improve the buildings performance considerably. The following are just some of the key characteristics of natural insulation:

Hygroscopic Performance: Unlike synthetic fibres, natural insulations have an inherent property, in that they can absorb and release moisture hygroscopically. It has been shown that rather than reducing their overall thermal resistance, its performance improves in comparison to synthetic fibrous insulation products. Including hygroscopic insulation materials within the structural fabric also reduces the potential for interstitial condensation to arise. Rather than allowing moisture to accumulate within the building fabric and condense, natural fibres can absorb and release the moisture over a short period of time, particularly when used in combination with an Intelligent vapour check, such as pro clima INTELLO PLUS or DB PLUS.

Specific Heat Capacity: As lightweight construction becomes more popular, and as habitable spaces in the attic buildings become more mainstream, it is important to account not only for the thermal insulation qualities of the insulation in winter, but also for potential overheating in the living space in summer months.

In the UK Energy specialists have warned that power cuts could become a regular occurrence if summers become hotter, driving up the demand for air-conditioning, which also leads to significant increases in CO2 emissions. In fact, the BRE have forecast that with global warming, the use of air conditioning could one day reach as much as 25% of the energy use in some buildings. Most natural fibre insulation materials have a specific heat capacity of over 2000J/kgK, compared with only 800J/kgK for mineral wool and 1400J/kgK for plastic insulations. When the high density of most natural insulations is accounted for, this means that the thermal mass of natural insulations such as Hemp, woodfibre and cellulose is much higher than that of conventional insulation materials with the same thermal resistance. The key parameter of amplitude damping and phase deceleration are optimised with natural fibre insulation products and provides designers with a passive approach to controlling room temperature in warmer summer months. Independent tests have showed that when natural fibrous insulation is used in habitable attic spaces the temperature on the warmest summer months can be up to 60C cooler, when compared to an equivalent construction insulated with mineral wool. In this way natural insulation creates a much more tolerable living environment even on the warmest days of the year.

It has been proven that overheating can be avoided in much warmer climates than ours without the need for air conditioning, resorting to it leads to dramatic increases in the running costs not to mention and increased carbon footprint and the cost of the environment.

Acoustics: Due to the combination of the natural insulations density, flexibility and ease of handing and cutting, natural insulation products again far out perform many synthetic fibrous and plastic insulation materials acoustically.

Thermal resistance: Natural insulation products can achieve a thermal conductivity as low as 0.035W/mK, which out performs the majority of synthetic fibrous insulations.

Sustainability: The sustainability and the ecological attributes of natural insulation products are second to none. BREEAM (Building Research Establishment Environmental Assessment Method) is the world's longest and most widely used environmental assessment method for buildings. It sets the standard for best practice in sustainable development and demonstrates a level of achievement. It has become an industry standard in describing a building's environmental performance. Some natural insulation products in fact exceed the current best "A" rating value. Cellulose insulation has an extremely low embodied energy, requiring far less energy to produce than other mainstream insulation materials. Cellulose insulation has zero ODP (Ozone Depletion Potential) and like many other natural insulation materials does not contain any added formaldehyde and is free from CFCs, volatile organic compounds (VOCs) or other toxic substances. Under the BRE's Environmental Assessment Method (BREEAM), cellulose insulation achieved a Green Guide Ecopoint 'A' ratings in every application of the insulation in various wall and roof constructions. In comparison with other synthetic insulation materials, the Ecopoints rating for cellulose was so good it exceeded the current best 'A' rating value. When, eventually, Cellulose insulation is removed from a building, it can be recycled again or disposed of safely, without creating toxic waste or biodegradability problems.

When one factors in the additional health benefits for the dwelling occupier, the fact that one can insulate a house completely both thermally and acoustically with natural insulation for approximately 3% of the complete build cost, the superior durability and the breathable features of natural insulation products, the cost effectiveness of these natural insulation materials becomes more apparent.

Airtightness and vapour diffusion through structural elements should be viewed as importantly as the insulation itself. This point has been well investigated many studies. One such report by Richard Oxley and Peter Warm in their CIBSE "Guide to building services for historic Buildings", found scenarios where the amount of air leakage in some cases was so high that the insulation was almost pointless. As we insulate our buildings to historically high levels, the negative affect of air leakage increases significantly. However if high levels of airtightness are to applied to structural envelopes, controlled ventilation, and active moisture management to reduce potential interstitial condensation should planned into the building design. Over the life of a building it must be self sufficient in itself in terms of both thermal performance and with regard to moisture management if it is to be healthy and durable over its lifetime. As most building failures can be attributed to water, by rainwater penetration, interstitial condensation or inner surface condensation due to cold bridging for example, the area of moisture management cannot be over emphasised.

While natural insulation materials have many excellent properties for improving the health, comfort and energy efficiency of buildings this does not mean that natural insulation products are applicable to every conceivable construction scenario. There are certain areas where natural insulations have their limitations and require careful design and application.

With the proper understanding of building physics natural insulation products provide an effective means of improving the energy efficiency of both new and existing buildings.

When considering the energy efficiency of buildings one can not under estimate the positive contribution which natural insulation materials offer buildings on so many levels. Constructions which are energy efficient, durable, healthy, ecological and sustainable in every sense of the word should be designed with some form of natural insulation, the benefits of which are not only in the money we save, but in the environment we live, particularly as it is estimated that we spend up to 90% of our lives in buildings. For more information visit www.ecologicalbuildingsystems.com

Written by Niall Crosson, Technical Engineer, B.TECH. MENG.SC MIEI