SUSTAINABLE CONSTRUCTION

SECTION 1— PACKAGING : Page 15

In September 2023, The Supply Chain Sustainabilty School published an extensive report entitled *"Packaging Optimisation in the Housebuilding Sector."*

More can be read about the the report and a copy downloaded from the link provided (right)

SECTION 1— RE-USE : Page 18

The concept of re-using both materials and entire buildings continues to gain traction as a solution to finite resources and attempting to move away from an economic model which prioritises demolition and consumption. Links to two recent articles are provided (right)

LINKS

"Packaging Optimisation in the Housebuilding Sector."
Breakthrough Report Redefines Built Environment Packaging (supplychainschool.co.uk)

Material re-use
Future houses to become material 'banks,' experts explain – EURACTIV.com

Building re-use
Demolish nothing: densifying the built environment through accretion - Architectural Review (architectural-review.com)

SGP
Architects + Masterplanners

norse
CONSULTING

greenspec

SUSTAINABLE CONSTRUCTION

SECTION 1—RENEWABLE ENERGY GENERATION : Page 19

Photo-voltaic cells for renewable energy generation first started appearing in volume around the early 2000's. Most PV manufacturers estimate that, on average a solar panel has a lifespan of 25 years. This means that over the next few years, the first generation of panels will start to be decommissioned. What happens to those old panels then?

Well... no-one is quite sure, given the potential scale of the issue. It is estimated that by 2050, up to 78 million tons of PV panels will have reached the end of their life while 6 million tons of new panels are being produced annually.

Although PV panels contain a lot of quite valuable materials such as silver and silicon, recovering these is far from easy. This requires a bespoke (and costly) process to separate the composite sandwich of materials and at the moment, it is far more economic to merely consign old panels to landfill than trying recycle their components. In the USA, where there is no legislation covering PV cell recycling, it is estimated that recycling could cost up to 10 times more than any revenue obtained from those recovered materials.

Under EU law, producers are required to ensure their panels are recycled properly and through its *Circular Business Models for the Solar Power Industry* project is trying to formulate end of life solutions for solar panels. Japan, India and Australia are preparing to instigate similar programmes.

LINKS

News story overview
Solar Panels Are Starting to Die, Leaving Behind Toxic Trash | WIRED

CIRCUSOL
Homepage | Circusol

MIT Technology Review
Solar panels are a pain to recycle. These companies are trying to fix that. | MIT Technology Review

PLASTIC

SECTION 2 — PLASTIC WASTE AND RECYCLING : Page 81

One potential solution to plastic pollution currently being investigated is that of “Plastic -eating bacteria.” Resulting from Japanese research, a form of bacteria has been discovered which appears to digest polyethylene terephthalate or PET. Much has been written in the media about the possible planet-saving potential of these microbes.

However, the truth is that the bacteria only seems to have a taste for one particular type of plastic and the research is in its very early stages. Also, as with most recycling, this solution of course addresses the symptom rather than the cause.

LINKS

News story overview
‘We are just getting started’: the plastic-eating bacteria that could change the world | Plastics | The Guardian

Live Science
Plastic-eating bacteria: Engineering and impact | Live Science

CONCRETE AND CEMENT PRODUCTS

SECTION 2 - ALKALI ACTIVATED CEMENT : Page 42

While research and development of AAC continues in the UK, it remains to be seen what impact the demise of the HS2 project may have on its' widespread introduction. In Australia, Geopolymer cement is being actively produced under the trade name "Earth Friendly Concrete." However, it is recognised that by using PFA or GGBS as a base for the cement substitute, the potential may be limited simply due to the availability of these constituents (c/f)

SECTION 2 - LIMESTONE CALCINED CLAY CEMENT: Page 43

Metakaolin or calcined kaolinite clay has been used a supplementary cementitious material for a number of years. Recently, an international consortium based in Switzerland has developed a product known as "LC3," which combines metakaolin with additional limestone. The manufacturing process leads to a chemical reaction which allows LC3 to reach a similar performance to OPC (CEM I).

As this reaction is a partial substitute for the burning process which gives cement its very high carbon footprint. It is claimed therefore that LC3 can save 30 -40% of CO_2 compared to OPC.

The most suitable kaolinite clays are typically found in tropical or subtropical climates, meaning that most efforts at marketing, production and use have been to date in India, South-East Asia and Latin America. However, there have been some notable projects

LINKS

Geopolymer Concrete
Geopolymer Concrete, A Carbon-Neutral Alternative to Cement (the-possible.com)

Earth Friendly Concrete
Earth Friendly Concrete - Capital Concrete

AAC Description
What is Alkali-Activated Concrete (AAC)? - The Constructor

LC3
LC3 – Limestone Calcined Clay Cement

CONCRETE AND CEMENT PRODUCTS

SECTION 2 - BETOLAR GEOPRIME : Page 43

Geoprime is a low carbon concrete which employs hitherto under-utilised industrial by-products as a cement substitute. As a proprietary product, details of the actual process aren't readily available. However, Betolar's philosophy is to instigate manufacturing close to the source of these by-products. Geoprime is marketed as a raw material for manufacturers to introduce into often existing fabrication processes such as hollow-core floor slabs. It is claimed that the alternative process can be implemented within four months, without major investment and can result in up to a 80% reduction in the carbon footprint of raw materials from present.

LINKS

Betolar Geoprime
Solutions for construction | Betolar

CROPS

SECTION 2 : Page 48 — HEMP

The Nova Institute in Germany has published a study on "*Carbon Storage in Hemp and Wood raw materials for Construction Materials"*. This seeks to investigate the comparative potential of both Hemp and Timber as carbon sinks and in terms of emissions from their production. Like most science pertaining to the natural world, the answer isn't straight forward. A link for the report is provided right.

SECTION 2 : Page 50 — FUNGUS

The potential of fungus to be used in construction and product fabrication has appeared in the media in recent years. Touted as a revolutionary organic and low carbon material, mycelium is the root network of a fungus of which the mushroom is a very small part of. The basic raw material is already marketed for use in bespoke product design and in acoustic panels.

In Australia, RMIT University in Melbourne is, at the time of writing (November 2023) seeking methods of industrialising production of fire-retardant panels made from mycelium. The properties of fungus mycelium have been known for a number of years but the greatest challenge is developing a viable method of forming the raw material into a usable product. Apart from the non-structural items described above, the area which offers potentially the greatest impact, is the possibility of use as an envelope material. Researchers at Newcastle University are developing a composite material known as "Mycocrete," which is created by growing mycelium into textile based moulds. At present, this has not progressed past a proof-of-concept prototype and so is some time away from being a viable commercially available construction material.

LINKS

Carbon Storage in Hemp and Wood raw materials for Construction Materials".
21-06-14_Carbon_Storage_in_Hemp_and_Wood (builtbn.org)

Fungal fireproofing
Fungi Make Safer Fireproofing Material - Scientific American

Mycelium Products
MYCEEN

Mycocrete
Mycocrete: A New Sustainable Building Material Made from Fungi (azobuild.com)