TecEco Pty. Ltd. ABN 62 090 097 591 Sustainable Technologies

The TecEco Times

Keeping you informed about the eco-cement project. Issue 16 22 December 2001

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Merry Christmas to All Readers – May the Break be a time for Reflection on Direction

Editors Note - A Time to Thank People

It is amazing how many friends I have made through this project. To all of you - thank you from the bottom of my heart. Without your encouragement I don't think we would have made it to where we are. Thanks in particular to Drs Vince Lyne and Bob Johannes, Vince is our greatest supporter, Bob our best critic – both TecEco could not do without. Also a special thanks to Bill Fawdry, for all the work he has done testing our formulations in a real production environment, to Ken Farrell for his work with a silver pen , to Steve Rank (DSD) who seems to drink in the same pub as merchant bankers in Sydney, Stuart Murrihy and Geoff Kelly our strategic advisors, Ian Smith and many others. The list goes on - thanks to Mr Hogarth who went all the way to the Lune river caves because I said I wanted a good sample of dolomite, thanks to Pozzolanic for their sample of fly ash, Phil Macoun at Qmag for running special samples of magnesia, Alastair Graham from the Tasmanian Conservation Trust for his enthusiasm, Doctors for Forests for letting me speak to them and many others.

More on Reversing Global Warming

In the last edition of the TecEco Times we considered a short history of the earth's atmosphere and then went on to consider a carbon based built environment as a means of reducing emissions.

The earth must support an additional billion people every ten years, over 90% of whom live in cities or towns[1]. **Buildings are responsible for some 30 per cent of the raw materials we use, 42 percent of the energy and 40 per cent of the air emissions**[2]. Sustainable development is essential if we are to support large numbers of people, arrest global warming and climate change and limit the impact on the natural environment.

Many are talking about battening down the hatches because global warming is inevitable. I lean on the side of optimism and say to you all that "The best way to predict the future is to invent it.[3]", now is the time to taken action, to make sure that all our fears do not come true, time to sail away and avoid the storm.

A carbon based built environment will stop global warming and climate change!

This is so obvious that everybody seems to have missed it. But then how often do we all fail to see the wood for the leaves?

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[1] United Nations Centre for Human Settlement (UNCHS) Habitat, http://www.unchs.org/habrdd/global.html
[2] Building for Growth. An Analysis of the Australian Building and Construction Industries. Industry Science and Resources. Australia 1998 at page 57
[3] Alan Kay

Correction to Previous Newsletter (Thanks Bob!)

On page 3 of Newsletter 15 dated 21 November, 2001 I said on page 5.

"By utilising this innovation and intelligent design there is no reason why buildings could not be entirely sustainable, not only with low embodied energies but low lifetime energies as well."

I was incorrect in that it would be difficult to make a building that was entirely sustainable. There are always materials such as aluminium and steel that will no doubt be used, without even considering heating, cooling and other lifetime energies. I think I was getting carried away with the enormous possibilities of the TecEco eco-cement technology.

The phrase should have read "By utilising this innovation and intelligent design there is no reason why buildings could not be much more sustainable, not only with low embodied energies but low lifetime energies as well."

There is no doubt however that TecEco have made a scientific breakthrough in the area of building materials that has the potential of stopping global warming it it's tracks and creating a new multi-billion dollar industry for Australia.

The manufacture of Portland cement requires a lot more energy than the production of eco-cements (the code name for our new material) and results in between .87[4] and 1.3[5] tonnes of CO_2 emissions per tonne of cement produced. A figure derived by Pearce [6] of 1 tonne of CO_2 emitted per tonne of Portland cement produced is generally accepted and the CO_2 produced accounts for between 5%[7] and 10%[8][9] of global anthropogenic CO_2 emissions. The firing of clay bricks also produces considerable CO_2 at around .28 tonne of CO_2 per tonne of bricks produced[10]. Portland cement production and hence CO_2 emission is currently in the order of 1.8 billion tonnes[11]. The quantity of clay bricks produced is substantial but not accurately known as the industry is much more fragmented. TecEco eco-cement formulations for some products such as bricks, blocks and pavers (eco-masonry products) set by absorbing CO_2 and are almost CO_2 neutral and with organically derived fibre reinforcing become a net sink. Numerous test blocks have already been made and have exceeded all expectations.

Because they absorb CO_2 during setting and hardening eco-cement products such as bricks, blocks and pavers mimic nature. After all wood is only the structure on which the live part of a tree lives. Wood comprises lignin, cellulose and hemicellulose – all carbon compounds. The potential for keeping the planet the way we can survive on it is enormous. Furthermore eco-cements offer a real alternative to traditional Portland cement for many applications. Eco-cements make use of high proportions of waste products, are the world's first totally recyclable building material and would reduce CO2 emissions by around 10 - 15%". TecEco believe the new technology will revolutionise the building industry throughout the world because it is so much cheaper to manufacture, more durable, utilises waste materials and is resistant to many of the chemical agents that attacked Portland cement.

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[4] Hendriks C.A., Worrell E, de Jager D., Blok K., and Riemer P*. Emission Reductions of Greenhouse Gases from the Cement Industry.* International Energy Agency Conference Paper at www.ieagreen.org.uk.
[5] Dr Selwyn Tucker CSIRO dbce Melb, pers. comm.
[6] Pearce, F., "The Concrete Jungle Overheats", New Scientist, 19 July, No 2097, 1997 (page 14).
[7] Hendriks C.A., Worrell E, de Jager D., Blok K., and Riemer P*. Emission Reductions of Greenhouse Gases from the Cement Industry.* International Energy Agency Conference Paper at www.ieagreen.org.uk.
[8] Davidovits, J *A Practical Way to Reduce Global Warming* The Geopolymer Institute info@geopolymer.org, http://www.geopolymer.org/
[9] Pearce, F., "The Concrete Jungle Overheats", New Scientist, 19 July, No 2097, 1997 (page 14).
[10] Dr Selwyn Tucker CSIRO dbce Melb, pers. comm.
[11] United States Government Survey (USGS) figure for 2000.

In the world we live in today the consumption of energy is totally related to the amount of carbon dioxide emitted and that is simply because over 95% of the world's power is generated from fossil fuels[12]. The embodied energy per unit mass of materials used in buildings (and hence carbon dioxide emitted) varies enormously from about two gigajoules per tonne for concrete to hundreds of gigajoules per tonne for aluminium. Because of the differing lifetimes of materials, differing quantities required to perform the same task and different design requirements using these values alone to determine preferred materials to reduce emissions is inappropriate. Materials such as concrete and timber having lower embodied energy intensities and hence emissions per tonne are used for construction in very large quantities; whereas the materials with high energy content and emissions such as stainless steel and aluminium are used in lesser quantities. For the average building by far the greatest amount of embodied energy (and hence emissions) is from concrete and steel. Because so much concrete is used in construction generally the affect of using eco-cements instead of concrete in an average house would cause the embodied energy to drop by more than 150 Gigajoules.

Because eco-cement products such as bricks, blocks and pavers for example have very low embodied energies, net carbon emissions are also low at around .08 tonnes CO_2 per tonne or even negative if waste organically derived fibres are used for reinforcing as well. 30 mpa concrete in contrast emits .39 tonnes CO_2 per tonne.

Eco-cements are potentially very cheap because they relied on a far more energy efficient thermodynamics than the production of Portland cement and used large quantities of waste. The use of fly ash is an example of waste utilisation. Global output of fly ash is in the order of 600 million tonnes creating huge stockpiles. Less than 20% of this is utilised in the production of building materials. In Australia, we dump around 8 million tonnes of fly ash annually. The rate of usage of this waste product would be increased immensely with the application of eco-cement technology, which binds fly and bottom ash and other wastes to make eco-masonry products and other building components. India for example produces 80 million tonnes and China over 230 million tonnes of fly ash a year which if utilised in eco-cement could provide shelter for millions of people.

Eco-cements can be used throughout the building industry and are capable of being implemented rapidly using already existing methods and equipment.

TecEco have received endorsement by leading scientists around the world including Dr Kwesi Sagoe-Crentsil from CSIRO Building Construction and Engineering and Professor F. P. Glasser of Aberdeen University, Scotland and Dr. Leon Burgess Dean of Deakin University in Australia

In an appraisal document, Dr. Sagoe-Crentsil said that "the theoretical basis of the proposed Eco-cement is logical and the economic and environmental benefits appear excellent."

Prof. Fred Glasser, an international expert on cement based materials and ceramics, said, in an academic report titled 'Cements Based on Magnesium Oxide', that the technology "represents one of the few recent advances in inorganic cements which are suitable for large volume production."

With the rapid growth in population of around 1 billion every ten years and most people (over 90 %) living in cities, sustainable development is critical in addressing the built environment needs of the growing population while limiting the impact on the natural environment.

If you can help with any statistics or information that assists us, know any journalists interested in a story about the technology of in any other way can assist our cause please do not hesitate to contact us.

[12] The generally accepted figure is more like 97% - Tececo prefer to be conservative.

JJ's Section (age 12)

Hi I'm JJ and I help dad (John Harrison) by maintaining the three web pages and the computers used for the TecEco project. We are now trailing a new system for sending the Newsletter, instead of attaching the file to an email we are linking directly to the file stored on the website. Let us know if you have any problems.

Publicity Campaign

We have started the publicity campaign based on a guerilla rather than Godzilla approach. This is simply because of a lack of resources to do the job with more of a splash!

We have invitations so far to write stories for at least four or five magazines and hopefully we can create some meaningful debate. If you know any editors of magazines etc. who are interested in a great story – please tell them to contact us!

What it is to be an Inventor

I have often contemplated my lot as an inventor and find inspiration in the following:

"Consider the postage stamp, my son. It secures success through its ability to stick to one thing till it gets there." -- Josh Billings

Thank you all for accepting and reading this newsletter – we appreciate your help and wish you a merry Christmas

We can change the world – all that is needed is a little focus and like the turtle and tortoise – we need to stick out necks if we want to get somewhere.

John Harrison B.Sc. B.Ec. FASA