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THE NATURAL SOLUTION TO GLOBAL WARMING

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THE BEGINNING HOLDS THE ANSWER

The first atmosphere most likely consisted of helium and hydrogen, which were rapidly lost to outer space. The second atmosphere was probably similar to the gases emitted by modern volcanoes (H_2O, CO_2, SO_2, CO, S_2, Cl_2, N_2, H_2, NH_3 (ammonia) and CH_4 (methane)) and was of course poisonous to much of life as we know it. (Note however that some bacteria still exist that use many of these gases.)

Around 3.8 billion years ago cyanobacteria evolved and started using oxygen to respire, in time plants evolved and the atmosphere today contains around 21% of oxygen, largely produced by photosynthesis. To a lesser extent the disassociation of water molecules by ultraviolet light has also contributed. Doing what nature has done for a long time and using carbon to create our own built environment makes a great deal of sense.

When a high proportion of wastes are used at the high magnesia end of the scale and carbonation occurs, a carbon based material suitable for our largest footprint on earth, the built environment results. A building material that uses a large proportion of wastes and is CO_2 neutral or even a net sink if carbon based strength giving wastes are used is a significant step towards sustainability. Problems such as global warming, climate change, global pollution, immobilising wastes and providing housing in underdeveloped nations are addressed in a sensible manner. At the other end of the scale, with high proportions of Portland cement, concretes are proofed against corrosion, potentially saving billions in infrastructure replacement costs. The TecEco technology is entirely compatible with Portland cements and blends can be achieved that are as strong or as sustainable as required.

The technology should be considered as important factor in getting Kyoto under way as one of the principle arguments against reducing emissions put forward by the so called “south” is in relation to the negative economic affects of reducing fossil fuel consumption.

Using the TecEco carbon-based system to create the built environment not only would result in a great deal of sequestration, (the technology could reduce anthropogenic CO_2 emissions by 20% or more) but provide economic benefits as well. People, not just forestry companies would be able to participate in reducing atmospheric CO_2

The potential for sustainability in relation to the built environment is enormous as according to the Australian Federal department of Industry Science and Tourism

(Australia)[1] buildings are responsible for some 30 % of the raw materials we use, 42 % of the energy, 25% of water used, 12% of land use, 40% of atmospheric emissions, 20% of water effluents, 25% of solid waste and 13% of other releases[2].

If a major science organisation had developed the material it would probably have taken 20 years (Portland cement took nearly one hundred years). TecEco Pty Ltd are almost at the commercial stage and it took just a few short years.

TecEco have the support of one the world's leading materials scientists, Professor Fred Glasser, who said that the technology "represents one of the few recent advances in inorganic cements which are suitable for large volume production," Another leading materials scientists, Dr Kwesi Sagoe-Crentsil from the CSIRO said that "the theoretical basis of the proposed Eco-cement is logical and the economic and environmental benefits appear excellent."

The company have also won the prize for the best innovation or invention at the recent Innovators and Inventors Expo 2002.

At last a way of providing thermal mass with a low lifetime energy is available and there has been enormous interest from the building industry, with a potential of over 8000 homes in Australia and the company has not yet advertised.

Making carbon based cement for the built environment relies on a very clean thermodynamic cycle and all the energy needed could be sustainable. The technology could also do a lot to reduce the deliberate release of CO2 during forest burns by providing an alternate use for waste carbon based fibre (wood in this case)

SUSTAINABILITY IS GOOD BUSINESS SENSE, YET WHY IS MORE NOT DONE?

Reducing global warming is also good business. The main reason is simply a cost issue - recycling wastes and minimising inputs reduces input costs. Lower embodied and lifetime energies for buildings mean that owning and living in them will cost less. (Carbon taxes will improve these differentials).

The TecEco technology demonstrates that it is technically feasible and makes good business sense to take steps to combat global warming – so why isn't more being done?

Is it possible that much of the inevitability we perceive in relation to global warming is a learned helplessness (Prof Martin E P Seligman3 and many others) in relation to what is an absurd consensus? Leith Sharp, of Harvard University 4) says quite rightly "people are

[1] Australian Federal department of Industry Science and Tourism, Environmental & Economic Life Cycle Costs of Construction, 1998 - Detailed Discussion Paper, (section 2 - page 8)

[2] The reference given by Industry Science and Tourism was Worldwatch paper 124 How Ecology and Health Concerns Are Transforming Construction Worldwatch Paper 124 by David Malin Roodman and Nicholas Lenssen

3 Seligman, Martin E. P., PhD. Learned Optimism, Random House Australia.

4 Sharp, Leith, Green Campuses, The Road from Little Victories to Systemic Transformation, Harvard University. (After the teachings of Somoan Asch, 1940's and 1950's)

conditioned to conform to group perceptions and to doubt and withhold their individual perceptions if they are in conflict with the shared reality of those around them. This has enormous significance when considering how people are currently responding to the demise of the planetary systems that support human life. The degree of inaction around this profoundly life threatening situation can perhaps best be explained by viewing our state as a massive 'absurd consensus' that is the product of our social conditioning which has enforced our subservience to, and blind confidence in, shared societal constructs of reality."

What then is it that has conditioned so many of us to learn helplessness in the face of the absurd notion that global warming is something we cannot do anything about?

Phillip Sutton, director, Policy and Strategy, Green Innovations Inc. says "we have not taken steps to mobilise people, ……we need to think very carefully about how the processes of imagination might be catalysed and how the mobilisation of people might be accomplished. What is blocking these processes, what is or might drive them forward? How can we trigger effective action?"

THE ROLE OF ENTREPRENEURS

Consider first those individuals who appear not to be conditioned into this unfortunate societal construct. Entrepreneurs (I consider myself to be one) are those rare optimistic individuals who conceive new business opportunities, and who take on the risks required to convert those ideas into reality. They seek to bring about change and new opportunities, both for themselves and for the communities they belong to, and therefore are an important part of any society. As the engine of change entrepreneurs take on the responsibility of identifying new commercial ventures, incubating ideas and championing their adoption, assembling the resources needed to bring these ideas to commercial reality and, finally, launching and growing business ventures.

In a market-based economy, environmental entrepreneurs will play a critical role in the proactive adoption of green business practices. They constitute one of the "pull" factors that entice firms to go green, as opposed to the "push" factors of government regulation and stakeholder/lobby group pressure[5]. All good teams need good leaders and much co-operative teamwork is required by the inhabitants of earth if we are to survive the long term future.

Consider why entrepreneurs do things. Perhaps it is because many of them have a mission in life other than just making money. According to Sean Covey, author of the 7 Habits of Highly Effective Teens, ' life is a mission, not a career. A career is a profession. A mission is a cause. A career asks, "What's in it for me?" A mission asks, "How can I make a difference?" Martin Luther King's mission was to ensure civil rights for all people. Gandhi's mission was to liberate 300 million Indians. Mother Teresa's mission was to clothe the naked and feed the hungry."[6] Many entrepreneurs have a passion to develop a better widget, run a better business, that is their mission; the money sometimes follows. As entrepreneurs we believe that what I have developed is important, and we have the passion, but the goals are so lofty, so immense we cannot do it on my own.

[5] Much of the description of entrepreneurs is from a call for contributions on the topic of ENVIRONMENTAL ENTREPRENEURSHIP by Greenleaf Publishing at journals@greenleaf-publishing.com.
[6] The 7 Habits of Highly Effective Teens, Sean Covey, Simon & Schuster Publishers.

Governments around the world should do all in their power to encourage environmental entrepreneurs as by so doing new technologies will doubtless emerge resulting in less emissions and more efficient sequestration.

THE LEGAL FRAMEWORK

Another way in which governments could encourage change towards sustainability is to improve the existing framework in which entrepreneurs can raise capital to bring to reality their creativity. For example at the present time in Australia S 708 of the Corporations Act 2001 is still far too restrictive as is the attitude of many of the venture capitalists – indeed the word "venture" has been misapplied. To change this we will need market related inducements. To help create a new set of sustainable market segments it is encouraging that some governments are already introducing market drivers. In Australia the NSW government seems to be leading the way, introducing a framework for the recognition of carbon sequestration certificates. Hopefully the Australian Federal Government takes up the challenge and it not tardy in introducing a national system.

WIDENING THE SEQUESTRATION DEBATE

Widening the scope of carbon sequestration to include the built environment will have far greater positive multiplier and flow on affects than forestry, encouraging entrepreneurs with new ideas and allowing more people to take positive personal actions –giving mums and dads not just forestry corporations a role.

THE ROLE OF THE MEDIA

Much of how we perceive things is conditioned by the media who could also take an improved role by exalting the achievements of our entrepreneurs as being desirable outcomes for society in general. I am personally sick of reading about wars and tragedies and would like to hear more about what good things we are doing people are doing to improve the lot of the community in general.

Now that is another point. Sociétés we live in today extol the virtues of the self. According to Prof. Martin E. P Seligman7 "in the past quarter century, events occurred that so weakened our commitment to larger entities as to leave us almost naked before the ordinary assaults of life." We have lost hope in the capacity in society to cure basic human ills and so in many ways have shifted our commitment to the self. Others call the age we live in the "me" age.

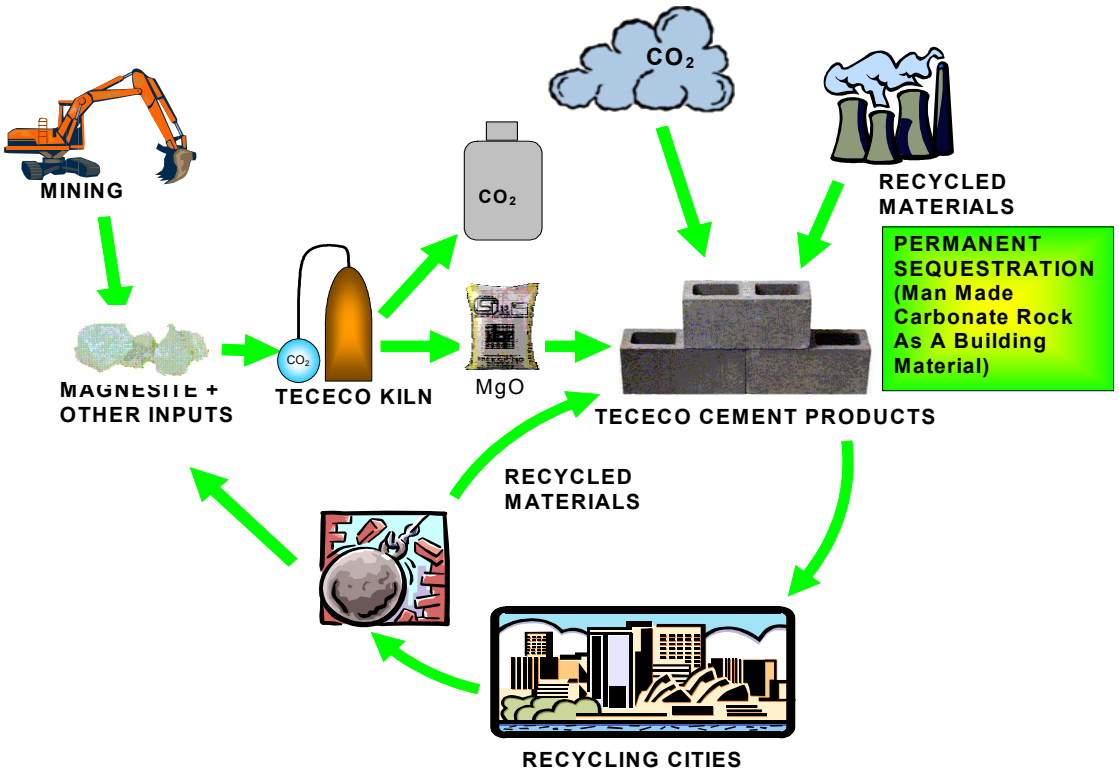
TECECO'S CONTRIBUTION

Why then is contribution by Tececo of such importance? To answer this I will now discuss in more in detail the technology.

I have mentioned the significance of the built environment in relation to sustainability and the significance of the contribution to emissions by materials such as concrete, steel, aluminum and masonry. At TecEco we have a holistic approach and look to nature for the answers. Using a building material that is CO2 neutral of even sequesters carbon is therefore very sensible - after all that is what nature has doing for the past 3.8 billion years. The potential for keeping the planet the way we can survive on it is enormous. By utilising the new technology and intelligent design there is no reason why buildings could not be

7 Seligman, Martin E. P., PhD. Learned Optimism, Random House Australia.

much more sustainable, not only with low embodied energies and therefore emissions but low lifetime energies as well.



The new eco-cement - technology will revolutionise the building industry throughout the world because it is recyclable, much cheaper to manufacture, more durable, utilises waste materials and is resistant to many of the chemical agents that attacked Portland cement.

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. 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 properties 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 followed by masonry and ceramics (together as a group). The average suburban house would contain in the order of 600 – 1000 Gigajoules of embodied energy. Because so much concrete is used in construction generally the affect of using eco-cements instead of concrete, masonry and ceramics could cause the embodied energy in an average house in Australia to drop by more than 250 - 300 Gigajoules and emissions in the order of 15 – 18 tonnes CO2!

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 .0375 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 rely on a far more energy efficient thermodynamics than the production of Portland cement and use large quantities of waste. The use of fly ash as an example of waste utilisation. The 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.

As a specific example of abatement that would result from using TecEco eco-cement technology, consider 100% adoption of eco-cement technology in the production of concrete blocks and replacement of clay bricks in Australia

Current emissions from clay bricks:

4.26 million tonnes produced X emission factor of .28 tonnes CO2[8] = emissions of 1.20 million tonnes.

Reduced emissions from clay bricks if substituted by eco-cement bricks

4.26 million tonnes produced X emission factor of .0375[9] tonnes CO2 = emissions of some .1597 million tonnes.

By subtraction the abatement would be over a million tonnes CO2.

Consider now the situation with concrete blocks:

Current emissions from concrete blocks:

2.76 million tonnes produced X emission factor of .05 tonnes CO2[10] = emissions of .138 million tonnes.

Reduced emissions from masonry units if substituted by eco-cement bricks

2.76 million tonnes produced X emission factor of .0375[11] tonnes CO2 = emissions of .1035 million tonnes.

[8] Dr Selwyn Tucker, CSIRO dbce, Melbourne. Pers. Com.
[9] The emissions per tonne of eco-cement bricks calculated by TecEco.
[10] Dr Selwyn Tucker, CSIRO dbce, Melbourne. Pers. Com.
[11] The emissions per tonne of eco-cement bricks calculated by TecEco.

By subtraction the abatement would be over .0345 million tonnes CO2, somewhat less but still significant. If waste organically derived fibres are also used the abatement could be .138 million tonnes or more, somewhat more significant.

The above are significant claims so consider. Think outside the box to see whether they make sense!