MEETING THE MATERIALS CHALLENGE OF THE FUTURE

World systems are interconnected and under stress. Daily we hear about salinity, water, weather, fishery, waste, global warming and other issues. Most of the news is unfortunately bad. It's all documented in a recent report "Global Change and the Earth System - A Planet under Pressure" IGBP SCIENCE No. 4 downloadable from the International Geosphere – Biosphere web site at www.igbp.kva.se.

The seawater around major third world coastal cities is grey brown with pollution speckled with white from plastic bags. The air smells and in most places in the world you cannot see very far – that is except in the Antarctic, Tasmania and Tierra del Feugo. We are probably not going to kick the fossil fuel habit until it kicks us and that will be when petroleum starts running out in around 30 years followed by natural gas in another ten or twenty. Coal will unfortunately remain in use for some time because it is relatively abundant.

With power over our environment comes the responsibility of managing it on a global scale without global government. What to do with waste and how to sequester all the carbon so we can survive the next millennia are just some of the questions that must be addressed.

Concrete is the biggest single material flow on the planet – some 6 cubic kilometers of it are poured a year accounting for around 10% of global anthropogenic CO2. Although concrete it relatively environmentally friendly, because of the shear volumes produced the development of the material into something much more sustainable than it is represents a major opportunity for changing the net carbon and waste flows on the planet.

There must be a way forward, yet there is no global government and the United Nations just doesn't have the power to make us change our ways.

An analysis of the history of the human race would reveal that the answer lies in economics. Moves towards ensuring a sustainable future by means such as changing concrete as a material have to be more economic than not changing it. But what about all those formula based standards that prevent change? Are they really for our protection or is the real reason for their existence to perpetuate the status quo and stifle innovation? The latter is certainly the effect they are now having.

Governments can force change by legislating for performance based standards. If they did, innovation would return to reward us with composites in which cement was still a major proportion but which have all sorts of what are currently waste materials included such as fibers, sawdust and plastic and new and improve properties including tensile strength, insulation capacity and lighter weight. Many of these waste materials contain carbon that eventually, when dumped in landfill converts to methane which is a gas 27 times worse for global warming than carbon dioxide.

Concretes are changing. In the last 25 years the alite:belite ration has gone up markedly. It is normal to add a pozzolans such as fly ash and fibers are seriously considered for specialist applications. To meet the challenge concretes need to change much more quickly. The new tec, enviro and eco-cement concretes developed by John Harrison of TecEco may just be the answer we are not but should be looking for. Why so? Many

reasons. They make concrete less expensive (or more profitable!) and they improve properties. Tec-cement concretes have a low proportion of reactive magnesia added. The lime is consumed by pozzolans and replaced with brucite which is another alkali. The big difference is that brucite is five orders of magnitude less soluble, mobile or reactive. A measure of durability never contemplated is added. But there are other benefits. They start with rheological improvements, continue with no shrinkage or bleeding during the plastic stage in which more affective pozzolanic reactions ensue and they end up with denser less permeable material that has a lower pH and is less prone to delayed reactions.

John Harrison first became known as the inventor of eco-cements. Eco-cements are similar to tec-cements but with a much higher proportion of reactive magnesia which in porous materials like porous pavement, bricks, blocks pavers, mortar, renders and the like carbonates forming mainly nesquehonite – a minerals which is possibly more acid resistant and stronger than either calcite or aragonite, the carbonates of calcium.

Another major global problem is what to do with toxic wastes. John has a formulation for them too that he calls enviro-cement which is similar to eco-cement but in non porous materials does not carbonate.

Mark Twain said "Everybody is talking about the weather but nobody does anything about it." John Harrison is trying very hard to provide us with practical solutions to our environmental dilemmas – so why isn't industry getting behind him to help? Maybe it is because they are not economists!

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