



AUSTRALIAN SECURITIES EXCHANGE ANNOUNCEMENT

23 February 2015

First field trial commences in USA of Australia's super strength carbon enriched concrete additive

Eden Energy Ltd ("Eden") is proud to announce that the first field trials have commenced in the United States of the Company's award-winning EdenCrete₅₀₀, a carbon-enriched concrete additive technology that adds super strength and performance to concrete but with very little extra weight.

The technology can potentially reduce the volume of concrete required, thereby generating great economic benefits as well as significant reductions in environmental impacts as global cement production accounts for around 5% of the world's total annual greenhouse gas emissions.

EdenCrete₅₀₀™, which in October 2014 won the Australian Civil Contractors Federation's 2014 Environment Award, is designed and formulated to deliver to concrete:

- Higher ultimate tensile and compressive strengths;
- Improved abrasion resistance;
- Reduced tendency for corrosion of steel reinforcement;
- Improved concrete workability and effectiveness of water-reducer; and
- Reduced cracks from concrete shrinkage.

Laboratory test work of EdenCrete₅₀₀ has demonstrated that the admixture can increase the compressive strength of cement paste by up to 27% and tensile strength by up to 14%.

Eden Energy's Executive Chairman, Mr Greg Solomon, said Hythane Company, Eden's US subsidiary, had commenced the first EdenCrete₅₀₀ enriched concrete field trials involving a full-scale concrete pour at Denver, Colorado in recent days in collaboration with Metro Mix, a US-based commercial concrete company.

"The structures built for the trial pour comprised new aggregate storage bins at the Metro Mix facility, constructed with two truck loads of approximately 20 cubic metres (about 48,000 kg) of concrete (see Figures 1, 2 and 3)," he said.

For personal use only



Figure 1 Metro Mix Concrete Batching Plant – Denver, Colorado



Figure 2 Loading aggregate into hopper from aggregate bin



Figure 3 Loader taking aggregate from existing aggregate bin

“These new aggregate bins, constructed with mild steel reinforced concrete walls (see **Figure 4**) half of which were made using EdenCrete₅₀₀ and with the other half being made using ordinary concrete, will be used to store hundreds of tonnes of sand, gravel or crushed rock. Front-end loaders will be frequently moving aggregate in and out of the bin, making strength and abrasion resistance in the concrete extremely important,” Mr Solomon said.



Figure 4 New aggregate bins being constructed with EdenCrete₅₀₀™

“This challenging application, combined with the harsh weather that Colorado has to offer, makes this is an ideal first commercial field trial for the performance-enhanced concrete where its performance against ordinary concrete can also be judged.”

Additionally, a number of test cylinders of the same two forms of the concrete that were used in the trial (including some with embedded steel reinforcing) were also produced and will each be tested at periodic intervals over the next two months to accurately measure both the relative strengths of each form of concrete and the level of corrosion of the reinforcing steel in each.

After the completion of the testing of the test cylinders, depending upon the level of success, and subject to Eden having first secured US Environmental Protection Authority approval for the commercial sale of the CNT enriched EdenCrete₅₀₀, Eden plans to progressively ramp up its production and commence commercial marketing of EdenCrete₅₀₀ in the US to a potentially very large customer base.

Mr Solomon said the higher tensile and compressive strengths EdenCrete₅₀₀ is expected to provide make it a great candidate for use in concrete beams, elevated slabs, and walls requiring high tensile strengths.

“Additionally, improved abrasion resistance makes EdenCrete₅₀₀™ suitable for applications with high traffic, such as parking lots and roads, especially for surfaces that support heavy equipment or where scraping or snow ploughing would be frequently required and therefore wear and tear is a significant concern and maintenance cost.”

EdenCrete₅₀₀ is not the only product being developed by Eden to enhance the performance of concrete. Admixtures suitable for a wide range of other applications are currently being engineered, including for high-performance applications, infrastructure, and coastal and marine applications.

These admixtures are intended to be able to reduce permeability, or improve concrete durability and resistance to chemical attack, or reduce the tendency for corrosion of steel reinforcement. These admixtures could potentially substantially reduce project costs by reducing the amount of steel reinforcement required, reducing the overall total concrete required, reducing frequency of maintenance, and increasing the service life.

Background

Hythane Company is Eden’s engineering and research and development subsidiary based in Littleton, Colorado. In previous development projects for other target markets, Hythane Company has created several alternative and more environmentally friendly fuel systems and solutions for various combustion engine technologies, including systems currently in production and sold through Eden Energy’s divisions in the US and India.

For many years, researchers at Hythane Company have also been active in the production, storage, and use of hydrogen for internal combustion engine fuels and blends, without the usual carbon dioxide greenhouse gas by-products. These hydrogen projects have led to several commercially valuable carbon-based co-products including carbon nanotubes (CNT) and carbon nano-fibres (CNF).

CNT are super strength, highly conductive (thermal and electrical) nano-carbon particles with a flexural strength of 200-300 times stronger than steel.

Based on technology developed jointly with University of Queensland, Hythane Company developed a new method of producing a low cost, efficient catalyst and refined and expanded the production process to its current modular, continuous or batched production design capable of producing commercial quantities of CNT (40 tonnes pa) and hydrogen without producing CO₂ (see Figure 5).



Figure 5 Eden's Denver-based CNT Production Clean Room and Reactors

Ongoing research with Monash University in Melbourne is also proposed targeting high strength CNT enriched concrete requiring little or even no reinforcing steel. This potentially offers far more flexible designs, a wider range of applications (particularly in areas such as seawalls and other marine structures which are subject to significant risk of concrete breakdown due to corrosion of the reinforcing steel), and significantly lower building costs. A far lower Greenhouse Gas footprint would be an additional point of significant advantage for CNT enriched concrete.

Additional research opportunities exist for optimising the recycling potential of the CNT enhanced concrete and developing innovations for crushing the strengthened concrete for use as a very hard aggregate suitable for use in future ultra-high strength concrete applications.

CNT are also effective as additives for improving performance and service life of various materials other than concrete. Targeting very high-volume applications in which the carbon products add significant value, the Hythane Company's Advanced Materials division, alone and also jointly with a number of universities and specialist companies in the US, India and Australia, is currently also focused on developing additives and admixtures for improving the performance of plastics, polymers, resins, and coatings.

Gregory H. Solomon
Executive Chairman