

Innovative SCMs for the US

Eco Material Technologies is the leading national supplier of fly ash and supplementary cementitious materials (SCMs) in the USA with the largest footprint and supply base in the market. CEO Grant Quasha speaks to ICR about the growth and development of the company, including its near-zero products and green suite of technologies dedicated to supplying the US cementitious market and decarbonising the building materials industry.

■ by ICR Research, UK

ICR: What is the background to Eco Material Technologies' (EMT) position as the only national marketer and distributor of fly ash in the USA?

Grant Quasha (GQ): Eco Material's fly ash division supplies approximately 50 per cent of the specification fly ash in the US. That is approximately 6.4Mta (7Msta), which is significantly larger than any other company in the market. Eco Material has the only truly national network of supply, covering 46 states and including over 50 sources of raw material. The company operates 50 terminals across the country, nearly 0.9Mt (1Mst) of storage, thousands of rail cars and hundreds of trucks which allows it to be the largest and only true national supplier of fly ash and SCMs in the country.

ICR: What are the key products in your portfolio?

GQ: EMT's product portfolio is designed to be the largest and most comprehensive portfolio of SCMs and engineered products to reduce the amount of Portland cement used in concrete at a variety of price points and replacement factors. All products

are zero or near-zero carbon, as the company uses little or no heat in its processes. Therefore, the products provide superior performance, are cost competitive and have significantly improved environmental attributes compared to traditional materials.

Here are some of EMT's offerings:

- Highly reactive pozzolans – the ongoing research programme of the EMT development group has resulted in a line of specified, high-performance, highly reactive pozzolan products used for a wide variety of construction applications and to optimise specific concrete properties.
- PozzoSlag® can replace a significant portion of the Portland cement required to make high-strength, durable concrete. It is 20 per cent stronger than Portland cement in 28 days and continues to gain long-term strength.

Grant Quasha, CEO of Eco Material Technologies, USA



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Moreover, PozzoSlag can be made at room temperature with virtually no emissions – a near-zero carbon cement. PozzoSlag is generally used as a 50 per cent replacement for Portland cement and concrete.

– PozzoCEM® can be used as a 100 per cent replacement product for Portland cement. Requiring no heat to produce, it has near-zero emissions.

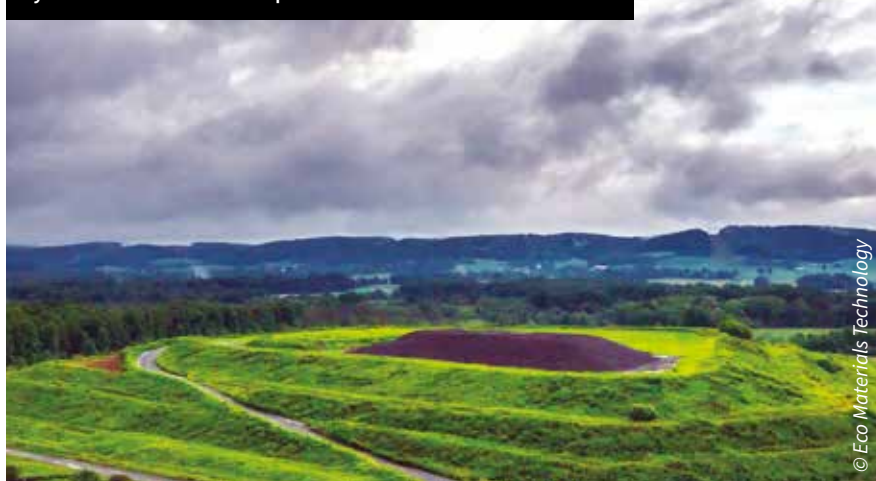
– Micron3™ is an ultra fine fly ash with a typical median particle size of 2-4µm, approximately 10x smaller than the median particle size of ordinary fly ash.

• Fly ash – EMT is the largest US source of the most commonly used pozzolan, fly ash. Fly ash aids in the formation of cementitious compounds to enhance the strength, impermeability and durability of concrete.

• Natural pozzolans – the company currently sells pozzolanic materials from its natural pozzolan mine in Kirkland, Arizona, and has other natural pozzolan sources under development.

• Engineered materials – EMT offers a full line of engineered materials for specialised applications. Its research

Eco Material's plant in Danville, Pennsylvania, which has provided fly ash used in concrete to repave roads around the state



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facilities are staffed with PhD engineers and chemists who can assist in developing products suited to anyone's particular needs. These materials are highly modified to impart performance-driven characteristics in the final product.

ICR: Can you give a percentage breakdown of materials in your business?

GQ: Fresh fly ash is more than two-thirds of EMT's business followed by synthetic gypsum and other materials. A smaller but increasingly important part of the business is the production of harvested fly ash, natural pozzolans, and PozzoSlag and PozzoCEM, which are manufactured products.

Creating a national network

ICR: Last year EMT acquired Boral's North American fly ash business and Green Cement Inc (GCI) for US\$755m. What was the rationale behind the acquisitions and what do they add in terms of facilities and market presence?

GQ: Boral's business represented the market leader the way EMT currently decarbonises cement and concrete in the US. With the nation's largest SCM business, it was a perfect complement to the smaller but more advanced Green Cement business. When the business came up for sale, EMT saw an opportunity to create a national network, and the largest footprint and supply base of any player in the SCM market. The merger solved each company's greatest challenge: Boral's need to embrace more advanced SCM technologies to reduce its reliance on fresh fly ash, and Green Cement's need for more feedstock for its advanced processes. GCI required a larger network and a larger supply of raw material to be rolled out more aggressively. Marrying the two businesses together was synergistic for both companies because it allowed Boral's business to get back to a path of growth. Meanwhile, it allowed Green Cement the ability to supercharge its own growth and to backward integrate into its own raw material supply.

Decarbonisation goals and near-zero building materials

ICR: Can you provide an overview of the technologies and approaches you have adopted to lower carbon emissions from Portland cement and concrete?

GQ: EMT has re-engineered pozzolanic cement to make it react faster – matching

the one-day performance of Portland cement. The company's products can be made at room temperature with virtually no emissions – a near-zero-carbon cement. While the mix design will depend on numerous factors, some customers are utilising its pozzolanic cement at 100 per cent replacement with no need for Portland cement. Its most popular advanced material, PozzoSlag, allows customers to reduce the total amount of binder material required to hit their strength targets by up to 60 per cent. Simply put, that means higher margins per job.

The majority of EMT's sales are of regular SCMs, mostly fly ash, which decarbonises concrete at a 20-25 per cent or greater basis every day in the US. EMT has added natural pozzolans into the mix with the start of the Kirkland pozzolan mine, which is also beneficial for reducing the amount of cement and concrete.

EMT's green cement technology has various manufactured products where it makes fly ash and natural pozzolans more reactive. PozzoSlag is the historically largest selling product from that process. Now PozzoCEM is being sold and used as a 100 per cent replacement for Portland cement in concrete, and is very high performing.

ICR: What are the advantages of these new, low-carbon products to the end user?

GQ: The advantages of these products are that they perform as well, if not better, than traditional cement products in the market. On top of that, these products have very low to zero emissions associated with them, unlike traditional products. EMT's goal is to produce products that are

as good as or better than what historically has been produced, with near-zero emissions. The products allow for quality and performance, along with a goal to improve the heavily polluting nature of the concrete and cement industry.

ICR: What role can cementitious materials such as fly ash, slag and pozzolans play in decarbonising the overall cement sector?

GQ: Cement and concrete account for eight per cent of all global greenhouse gas emissions and there are several different approaches to reducing that. One is to make the production of cement less carbon intense, the other way is to simply use less cement. EMT is focussed on reducing the use of cement by supplying products and binders that can replace cement in concrete by 20-100 per cent. Rather than just working to reduce the carbon footprint of concrete, EMT is focussed on cutting out as much of the Portland cement as possible.

ICR: What are the key drivers for the ongoing shift towards low carbon cements. Do you see any emerging trends?

GQ: Globally, policies are focussed on lower emission products and driving toward net zero. In the US there is no national carbon tax. However, corporations, their investors and the public are demanding products that are lower in carbon, and that will continue to drive the industry in the right direction. What's needed is more proactive activity by governments through sponsorship projects and products like you are seeing with the potential from the Inflation Reduction Act.

Another key driver toward low-carbon cement alternatives is to adjust

Eco Material's Danville operation is a prime example of the opportunity to harvest previously disposed fly ash for use in concrete



the standards and specifications that limited the use of more novel and cleaner materials. Standards that are based only on prescriptive specifications, such as those that govern what constitutes specification fly ash and Portland cement, need adjustment to focus instead on performance. Significant progress has been made recently in this area.

Lastly, the government could implement a cross-border carbon levelisation programme. The US currently imports approximately 18.1Mta (20Msta) of cement because it doesn't produce enough of it. The only thing more carbon intense than cement being produced in the US is cement being produced somewhere else, and then shipped halfway around the world.

US cementitious market potential

ICR: How much fly ash is available annually for cementitious cement production in the USA? And what are the long-term prospects for fly ash availability in the US with the number of coal power plants declining, and also from landfilled (beneficiated) ash?

GQ: Currently about 25.4Mt (28Mst) of specification fly ash is produced in the US. That number is declining as coal power plants shut down. EMT is helping to offset that decline by investing in both the beneficiation of landfilled fly ash (with projects such as the partnership with Georgia Power on a beneficial use project at Plant Bowen) and with natural pozzolanic materials like its mine in Kirkland. The company anticipates that its investments will help to stop that 25.4Mta (28Msta) from declining and instead allow it to increase to help provide continued supply of regular SCMs. Over the long-term, its efforts will increase the use of SCMs and their replacement factors and, in turn, increase the decarbonisation of concrete.

On the harvesting side, there are more than 1.8bnt (2bnst) of previously disposed ash in landfills. The government should advocate for the beneficial use of that 2bnt of landfilled ash. The previously disposed ash will otherwise just sit in that landfill and never go away. Why put a band-aid on a problem by capping and closing a landfill when much better alternatives exist? What EMT wants is for previously disposed ash to be reprocessed through technology like ours, so it can clean up these landfills for good and decarbonise concrete.

ICR: Are there any similar products to fly ash that could be readily substituted for it – perhaps calcined clays for example? Would EMT be looking to become a player in the calcined clay distribution market?

GQ: EMT has looked extensively at calcined clays, and they can be a replacement for Portland cement and fly ashes. However, calcined clays require calcining, which means that they need to be heated to make them reactive. While calcined clay can replace Portland cement and reduce emissions – it is a half step. EMT's focus is on zero and near-zero carbon, non-heat replacements. Calcined clays are beneficial but only solve half the problem.

ICR: What is the market potential of cementitious materials in the USA and which states are emerging as primary consumer markets in this category?

GQ: The market potential of cementitious materials in the USA is about 108.9Mta (120Msta). Key markets for EMT include Texas, the biggest cement and concrete market in the country, and California, where it expects more rapid adaptation of some of the more advanced near-zero and zero carbon products over time due to their focus on more sustainable infrastructure. California was an early adopter of fly ash utilisation in concrete for the performance benefits and creating more durable concrete. Years later, the environmental benefits to that early adoption of the positives used for concrete performance can be seen.

ICR: Which major projects has the company been involved in?

GQ: EMT's advanced products like PozzoSlag have been used to pave more than 1000 miles of highways, including Pittsburgh's Highland Park Bridge Interchange reconstruction project, the Central Susquehanna Valley Transportation Project and Texas' I-45. PozzoSlag has also been used to build airport runways, construct bridges and support numerous other building projects. EMT fly ash has been used by every major



Some 2bnt of previously-disposed fly ash sit in landfill, awaiting reprocessing and benefitting the cement industry

US Department of Transportation and supports millions of tonnes of concrete infrastructure.

ICR: What 3D printing pilot projects has the company been involved with?

GQ: Hive 3D Builders, a vertically-integrated homebuilder that leverages proprietary 3D construction printing technology to build innovative homes at significant cost savings, is the first company to successfully 3D print using Eco Material PozzoSlag. In 2023 Hive will be using PozzoSlag and PozzoCEM to build a 90-home development in Texas. EMT is working with other companies to discuss the potential use of Eco Material cement in other upcoming projects.

Fly ash and natural pozzolan usage and treatment

ICR: What are the main differences between Class C and Class F fly ash, and which is more beneficial for producing low-emission cement?

GQ: Class C fly ash possesses more self-cementing properties than Class F fly ash, but both classes are useful in reducing carbon intensity and imparting other performance benefits to concrete. EMT actively markets large volumes of both classes of ash.

“Over the long-term, our efforts will increase the use of SCMs and their replacement factors and, in turn, increase the decarbonisation of concrete.”

ICR: How does EMT's carbon burn-out technology improve fly ash quality?

GQ: EMT has a suite of technologies that are designed to help take either landfilled or off-spec ashes and turn them into on-spec fly ash. One of the main problems with some landfilled ashes or other off-spec ash is an overabundance of carbon in the ash, which is deleterious to its performance.

EMT is focussed on the most efficient removal of carbon from those ashes. One way to do that is through its carbon burn-out technology, which will remove the carbon through heating. Because this process does have some emissions associated with it, the company been more focussed on other technologies that it plans to roll out soon, which remove the carbon in an equally efficient, yet less emissions-intensive way.

To do this EMT will utilise its efficient carbon offloading (ECO) system which it plans to introduce next year. The proprietary system removes carbon in a manner that is as efficient as carbon burnout but has far lower emissions intensity. EMT's full suite of technologies includes technologies for carbon removal and carbon passivation.

ICR: Does the natural pozzolan that the company uses vary greatly in quality, moisture and composition between different mines that the company

operates? How might variations be overcome with corrective materials?

GQ: Natural pozzolan varies more dramatically than fly ash. Every reserve is different. As products are brought into market, it is essential that companies make sure the projects and products meet the needs of the market.

EMT is well positioned due to its extensive testing and work around pozzolanic material. The company has tested close to 50 different kinds of natural pozzolans and understands how to make them into successful SCMs.

Action on emissions reduction

ICR: What work does EMT carry out with emission-reduction partners ClimeCo?

GQ: ClimeCo is a partner for learning how to access carbon markets. EMT works with them on how to best invest in materials and projects in relation to the carbon markets.

ICR: How does the Climate Action Reserves' Low-Carbon Cement Protocol work for EMT?

GQ: The low-carbon cement protocol is Climate Action Reserves' protocol to approve. EMT is strongly supportive of the protocol as it feels that it is one of the best ways to incentivise its company to continue to invest in novel technologies to increase the amount and impact

of SCMs that will allow a more rapid decarbonisation of cement and concrete industries

Potential areas for growth

ICR: How do you see EMT evolving in terms of building material products and technologies?

GQ: Some of EMT's technologies do have applications in other areas that the company is pursuing. EMT is a technology company, not just a SCMs company. There are other areas where EMT thinks its technology will be applicable, although at this point in time, it is a little bit too early to comment on those fronts.

ICR: Do you intend to grow further through acquisitions? If so, in which geographies and segments?

GQ: Eco Material Technologies has a very strong pipeline of internal organic growth that it focusses on. In early 2024 the company plans to open its second natural pozzolan operation, which will produce ~272,155tpa (~300,000stpa) of Green Cement products. Its goal and business plan are not to just grow through acquisitions. However, EMT is open to opportunities that will expand its existing and future value proposition in both SCM companies and advanced products and technologies by acquisition, if appropriate. ■

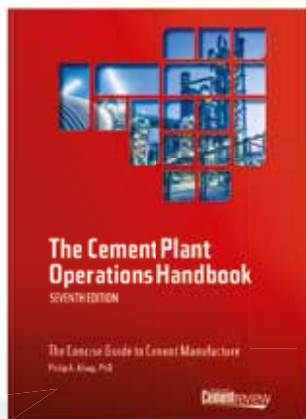
EMT's PozzoSlag has been supplied to several US infrastructure projects, including highways, bridges and airports



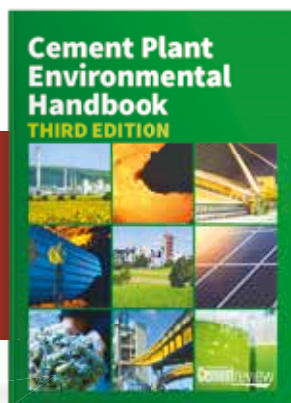
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