Standing the test of time

Following the increasing use of supplementary cementitious materials (SCMs), US-based SCM supplier Eco Material Technologies is expanding its materials testing and research facility in Georgia.

■ *by **Eco Material Technologies**, USA*

As supplementary cementitious materials (SCMs) continue to expand their role in cement and concrete decarbonisation, laboratory research and services are an integral part of ensuring product performance, consistency and quality. Advanced SCM and fly ash supplier Eco Material Technologies is responding with a significant investment and expansion of its Materials Testing and Research Facility (MTRF) near Cartersville, Georgia, USA.

Eco Material's AASHTO-accredited cementitious materials and concrete laboratory is one of the company's two main research facilities, with the other located in Texas. The facility has led the way in advancing coal combustion product utilisation for more than three decades. The team processes more than 3500 samples of coal combustion products, pozzolans and building products each year. Their work is critical for providing technical services, quality assurance and R&D for both produced and beneficiated coal combustion products. In addition, the facility conducts an array of concrete testing services for aggregates, cements, concrete alkali reactivity analysis, concrete sulphate testing, hardened concrete petrography and more. MTRF's technical service representatives (TSRs) are capable of working with customers to prepare and test concrete trial batches to demonstrate the value of using SCMs.

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Eco Material Technologies' new Materials Testing and Research Facility in Georgia, USA, will enable the company to meet the research and testing requirements presented by the growing use of supplementary cementitious materials

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The 2025 expansion

In July 2025 Eco Material will expand its facility to a comprehensive 1524m^2 (16,400ft^2) research centre, representing a US$8m investment. The state-of-the-art facility expansion will drive innovation in the utilisation of harvested ashes, green cement products, and natural and other industrial-based pozzolans. The expansion will include a 1022m^2 (11,000ft^2) building complete with all current pilot-scale technologies, offices, a conference room, material storage and additional space to expand for future innovations in the business.

New technologies that will be installed to accelerate beneficiation projects and support existing operations include pilot-scale equipment such as a ball mill, classifier, rotary dryer, efficient offload carbon (ECO) system (developed by Eco Material Technologies), green cement (GC) reactor, pre-screener, jaw crusher and material handling equipment. The facility's new laboratory equipment will include a laboratory ball mill, laboratory jaw crusher, and various testing equipment and analysers. The goal of the expansion is to get products to market quicker and better serve customers.

In addition, Eco Material will expand the MTRF team to about 16 members to operate the new equipment. The staff will include a senior research manager, a chemical technician, multiple laboratory technicians, a laboratory manager, a quality assurance manager, a physical laboratory supervisor, an R&D associate, a geologist and a laboratory support coordinator, among other full-time employees. The facility is currently staffed with American Concrete Institute (ACI)-certified personnel managed by innovative leaders in the SCM industry. Eco Material also has three full-time technical services managers available to customers and employees as needed, providing technical

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Eco Materials' testing and research facility is fully equipped to conduct material characterisation, paste, mortar and concrete testing

support and managing testing and C618 certifications for 62 coal ash and natural pozzolan sources.

Expansion drivers

The expansion comes as Eco Material Technologies continues to transform into a more broadly-based manufacturer of SCMs that decarbonise the built environment. The Georgia Materials Testing and Research Facility is taking the lead role in validating the quality of potential coal ash deposits, and testing new and emerging technologies. Since the ability to perform pilot-scale tests is an important step in conducting these evaluations, Eco Materials' investment in the facility means beneficiation projects and new technologies will move ahead faster.

Examining SCM quality

Businesses engaged in the manufacture of low-carbon concretes rely on MTRF's laboratory research and testing services. To examine the quality of ash and other SCMs, the company's facility features multiple rooms with advanced technological equipment. The laboratory contains several pieces of equipment, including:

- particle size analyser that gives a fast analysis of the particle size distribution of fine powders such as fly ash, natural pozzolan and cements
- optical microscope to visually analyse fly ash and bottom ash samples as well as to detect potential impurities
- scanning electron microscope to provide images of individual particles or hardened paste magnified up to 300,000x, providing information on particles as small as one micrometre regarding shape and composition
- thermogravimetric analyser, an essential tool for identifying and quantifying compounds and potential impurities found in fly ash and other SCMs. It can also be used to evaluate the pozzolanic properties and cementitious properties of fly ash.
- calorimeter to evaluate the effect of fly ash and other SCMs on set time and heat release. It can also be used to estimate the reactivity of SCMs.
- infrared carbon analyser to measure carbon content by infrared detection — a more accurate test for coal ash than loss on ignition
- specific surface area analyser to estimate surface area available for reaction in cementitious materials and the effects of carbon on adsorption
- X-ray diffractometer, a powerful tool that can help quantify crystalline phases as well as amorphous content, which is typically associated with reactivity in SCMs

The physical testing capabilities of MTRF include ASTM C109, C311, C1012, C1260 and C1567. These tests help to estimate the effect of fly ash and other SCMs on fresh and hardened mortar.

The 158m^2 (1700ft^2) concrete laboratory allows Eco Material to test SCMs in the intended final product, concrete. MTRF technicians can perform concrete testing according to ASTM C192 to determine the effects of SCMs in slump, set time, finishability and workability in fresh concrete as well as compressive strength, permeability and other durability metrics in hardened concrete.

These capabilities, in addition to the new pilot plant, will allow MTRF to conduct research and testing from raw cementitious materials to paste, mortar and full-scale concrete batches covering the spectrum from basic materials characterisation to full product deployment in concrete.

Concrete testing activities

Eco Materials' testing and research facility is fully equipped to conduct material characterisation, paste, mortar and concrete testing, strength and durability testing, as well as small-scale mineral processing capabilities. Staff can conduct compressive strength tests to determine the strength of mortar and concrete mixtures. This is especially useful in determining the effect fly ash and other SCMs have in fresh and hardened concrete. Concrete testing includes the making of concrete specimens to determine strength and permeability measured by surface resistivity. The concrete surface resistivity test helps to estimate the impact of fly ash and other SCMs on improving permeability, which in turn improves concrete durability. Concrete is made according to ASTM C192, which allows the laboratory to evaluate the effects of fly ash on the fresh and hardened properties of concrete in a standardised manner.

By investing in the research and testing of fly ash and other SCMs, Eco Material is both expanding its leadership as a near-zero-carbon cement producer and investing in environmentally friendly alternatives to Portland cement that improve the performance and longevity of concrete. ■