Don Valley Engineering

The Alternative Raw Materials (ARM) Project

Client: Breedon

Location: Hope Cement Works, Hope, Derbyshire
Industry: Cement/Quarrying

Project Overview

The development and execution of the Alternative raw Materials (ARM) Project by Breedon demonstrates their commitment to improve the sustainability of the cement production process and to drive down its carbon footprint by increasing the use of recycled materials in the production of cement. The alternative raw materials being used by Breedon are Pulverised Fuel Ash (PFA) and Slate Blindings. PFA is the residue left over from burning coal to produce electricity and slate chippings the discarded arisings from the manufacture of roof tiles.

The environmental benefits do not end with the use of recycled materials; all deliveries of these materials are by rail, with one delivery by rail being the equivalent of 80 deliveries by road. This was a major consideration when considering the location of the Cement Works within the Peak District National Park, the impact of the local highway infrastructure and emission reduction.

PFA Sample

Slate Sample

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Scope of Work

In June 2023, Don Valley Engineering were retained to develop the layout and detailed design of the materials handling system for Breedon Cement's Alternative Raw Materials (ARM) Project at Hope in Derbyshire. This was followed in May 2024 by the order to supply, install and commission the agreed design.

Challenges Faced

The engineering challenges this project posed were significant, particularly those associated with plant layout. The rail infrastructure on site is some 300m away from the proposed site of the bulk storage building meaning that the layout of the handling system had a myriad of obstacles to negotiate or in engineering terms "design constraints" namely:

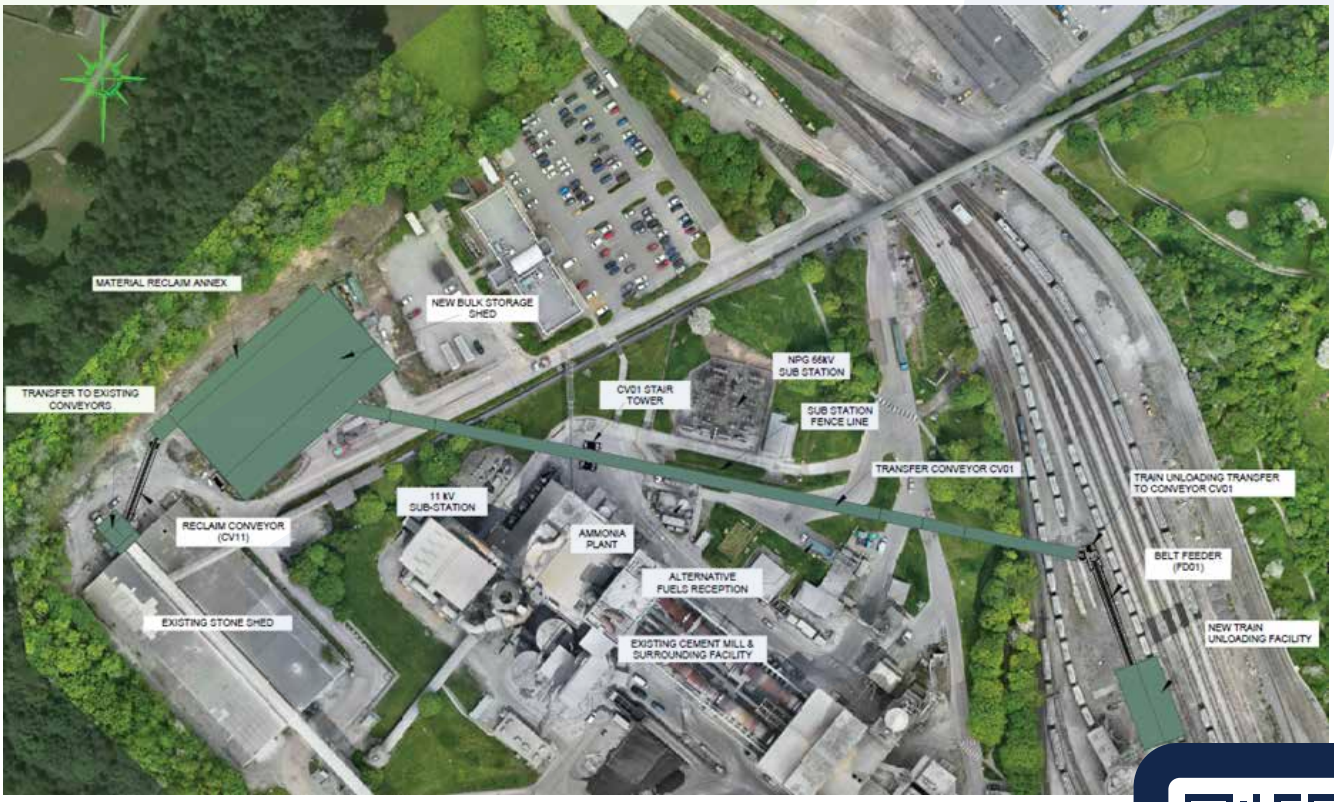
Traversing operational site rail and road infrastructure
Maintaining a safe distances from a Northern Power Grid 66,000V sub-station and a site 11kV sub-station
Maintaining existing vehicle routes for the delivery of Alternative Fuels and Ammonia
Avoid clashing with the site's material sample transport system
Avoid nearly 100 years of buried site services, power, drainage, telecoms, etc.
Construction Challenges included:

Site constraints that dictated the size and positioning of cranes
Maintaining access for road deliveries of Alternative Fuels and Ammonia
Minimising the impact on day to day operations by scheduling plant shutdowns required to install new equipment to coincide with Breedon's planned maintenance activities.
Working in and amongst rail infrastructure
All these were overcome by working collaboratively with all stakeholders involved in the project.

In addition to the layout challenges, the Don Valley team were faced with designing conveyors, transfer chutes, hoppers, bunkers, feeders and a blending system that works for two bulk materials with very different material properties.

PFA, a fine, dry powder in original form behaves like a sticky sand in its reclaimed form, holds moisture and is abrasive. PFA can have a bulk density as low as 900 kg/m3. Slate on the other hand is a coarse stone with sharp edges that can be in agglomerated lumps due to the percentage of sticky fines in the product, this product is not only abrasive but presents the risk of impact damage. Slate can have a bulk density up to 1570 kg/m3. The cohesive properties of both materials focused our design effort on chute/hopper geometry and selecting a suitable liner material.

Technical execution also demanded precision despite the time pressure, with critical alignments, torqueing, tolerances and measurements needing to be completed accurately while relying on specialised tools and OEM parts that could cause delays if missing or faulty. These challenges were compounded by the financial impact of downtime, where every hour of shutdown represented substantial production loss, creating tension between fast turnaround and quality workmanship. Additionally, long hours and compressed schedules contributed to workforce fatigue, increasing the risk of errors and underscoring the importance of careful management and control throughout the shutdown.



Solutions Delivered

The mechanical handling scheme is designed to transfer material from the Rail Unloading Area to a new bulk storage shed some 300m away without impacting the exiting site infrastructure and at a rate of 370 m3/h. The bulk storage shed sized to store 4000T of PFA and 2000T of Slate, a Shuttle Conveyor in the roof of the building was be designed to put down the two stockpiles of material without contamination.

Material reclaim is via loading shovel into 2 buffer hoppers, one for PFA and the other for Slate. These hoppers would be sized to provide approximately one hour of buffer storage to allow shovel drivers to change shift and to take a break whilst working. Each hopper was fitted with extraction technology suitable for delivering variable material feed rates of 25 to 85 TPH of PFA and 5 to 20 TPH of Slate. Field devices were supplied to enable the ratio of PFA to Slate to be controlled based on inputs to the plant control system.

Belt conveyors collect the blended material and transfer it from the Bulk Storage Shed to a new building positioned over the existing plant feed conveyors which are located in a tunnel under the existing Stone Shed. Within this building, named the “Blended Hopper House” the blended material feed is split into two in order to feed two existing belt conveyors via new belt feeders positioned above each conveyor at rates of 5 to 50 TPH.

Outcome

The handling system was commissioned in August 2025 and was proven to deliver on the required material handling rates, storage capacities and material blend accuracy. The successful delivery of the shutdown site created a huge sense of pride and job satisfaction across the team. Everyone walked away knowing they had contributed to a complex, high-stakes job that was carried out to the highest standard.

When unexpected issues surfaced, we didn’t hesitate; we adapted, solved problems on the spot and kept the shutdown moving forward. Whether it meant taking on additional tasks, reorganising teams or working extended hours, we did what needed to be done to ensure the job was finished safely, efficiently and to a high standard.

In the end, it was Don Valley’s determination, teamwork and unwavering attitude that turned a difficult shutdown into a successful outcome.

ARM Project Video: