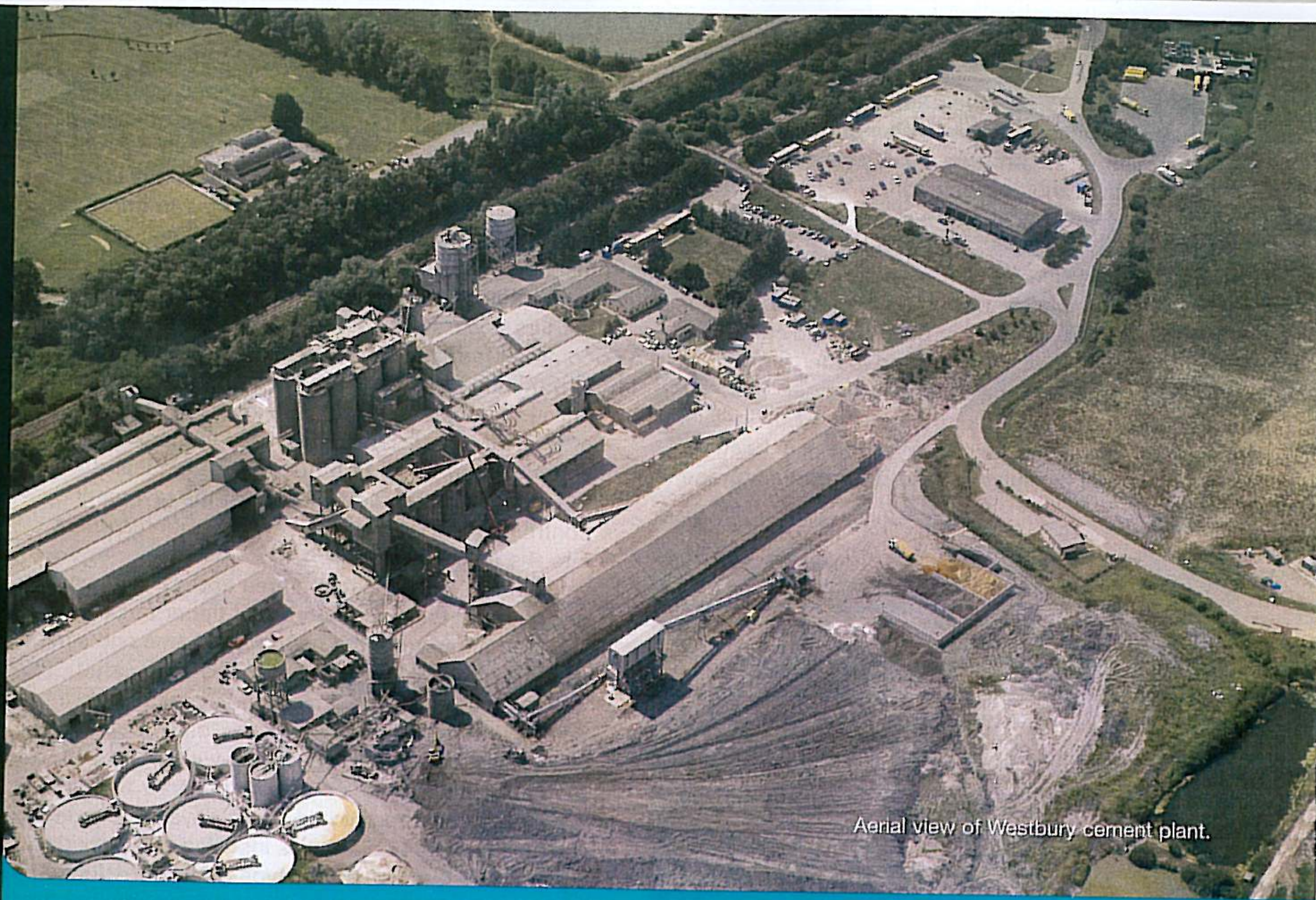

Aerial view of Westbury cement plant.

Accurate and Effective ARM Handling

Fairport Engineering Ltd, UK, recently completed a new alternative raw materials plant for Lafarge's Westbury plant.

The project

Fairport Engineering Ltd has recently completed the design, supply, construction and commissioning of a new alternative raw materials (ARM) plant at Lafarge Cement's Westbury plant. The aim is to provide an accurate and effective system for the addition of silica, alumina, and iron oxide materials to the kiln feed. As is generally well-known, these materials are traditionally difficult to handle and are very prone to clogging up in hoppers, leading to variations in discharge/addition rates. Equally, when these materials are derived from (or as) waste products, as is the case at Westbury, their consistency and quality can vary widely, thus presenting yet another materials handling challenge.

The more detailed performance criteria for the new plant were to:

- Receive and store ARM in separate designated ground storage bays.
- Uplift and transport the ARM into separate designated storage silos.
- Extract and transport the ARM in an accurate and effective manner into the kiln feed.
- Provide a spillage and waste-free materials handling facility.

The aim was to achieve an improvement in the consistency of the kiln feed with a consequent improvement in the product quality. Overall plant reliability would thus be gained.

ARM plant description

The ARM are delivered to a purpose-built reception area using a newly constructed access road. The individual ARMs are then tipped into dedicated ground storage bays. A front-end loader then loads the required ARM into a reception hopper. The material is transferred along a common bulk delivery conveyor onto a shuttle conveyor that has been pre-positioned to deliver to the designated storage silo. These silos each provide a capacity that is in excess of 8 hr of operation and so are stocked at the beginning of each operating shift. The geometry of the silos was selected to promote mass flow and thus enhance continuous extraction of the oxides. Each silo is fitted with a mechanical rotary discharger to extract the materials onto a dedicated weigh feeder situated underneath each silo. These feeders accurately deliver the materials onto a common transfer conveyor system, which discharges into the intake chute of the existing oxide mill. An online materials analyser was installed downstream of the ARM plant. This constantly monitors the chemical composition of the raw material and thus maintains the consistency of the raw meal by controlling the ratio of the various ARM materials into the oxide mill.

ARM storage silos.

ARM weigh feeders.

Feed conveyor for ARM silos.

The new ARM reception area access road was designed for fully laden 35 t road tipper trucks and included an appropriate drainage scheme and simple wheel wash. The ARM is stored and segregated in open-ended concrete storage bays that have a smooth internal finish to allow the loader bucket to load up to the wall edge. All bay walls are 3 m high and each bay has sufficient capacity to store enough material to provide seven days of operation. A single bulk intake unit was installed and is loaded by a mobile plant. A grizzly type grid was included to prevent oversize and tramp materials entering the intake unit. The intake unit discharges onto the bulk delivery conveyor, which has a capacity of 300 tph and passes the material onto a shuttle conveyor above the three dedicated storage silos. The shuttle conveyor moves horizontally on rails to distribute material into all three silos as required.

The silo dischargers are equipped with variable speed drives that promote the mass flow of material within the silo. A weigh feeder is installed at the outlet of each silo discharger to feed materials into the oxide mill at the required quantities to an accuracy of +/-1%. The design also makes provision for the retrofitting of lump breakers between the silo dischargers and weigh feeders, should the required accuracy not be achieved. The weigh feeders deliver materials onto the common feed conveyor at a capacity of 50 tph. This conveyor runs parallel to the existing clinker store and delivers material, via a transfer station, onto the existing oxide mill feed conveyor.

The ARM plant is controlled from the plant's central control room. Fairport supplied the control philosophy, P&IDs and all other necessary process/electrical information required to allow Lafarge to achieve the integration of the ARM project into the existing operation. In order to control the remote mobile plant loading operations, a material loading indication system was installed in the reception area to signal which ARM was to be loaded into the reception hopper. These lights are controlled via the plant's central control room and are displayed as a traffic light system mounted local to the loading area where it is visible to the loader operator.

For further information, please contact the editor, who will be pleased to forward any enquiries to Fairport Engineering.