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Weigh batching aluminium powder to concrete blocks

H+H Celcon has automated the addition of aluminium powder to a concrete block mixture with a new weigh batching system.

In the 1950s, H+H Celcon of Kent in England developed a method of producing lighter concrete blocks by incorporating aluminium powder into the mixture.

The aluminium initiates a chemical reaction that generates minute bubbles. After the mixture partially sets, "Aircrete" blocks are cut and then cured in autoclaves, during which process the ingredients combine to form calcium silicate hydrates that strengthen the finished product.

The block-making process was partly a manual affair, and began with measured amounts of cement, gypsum, lime, and a sand slurry mix that were transferred from several exterior silos to a 2.2-cubic-metre capacity blender within the building on a mezzanine level six metres above the plant floor.

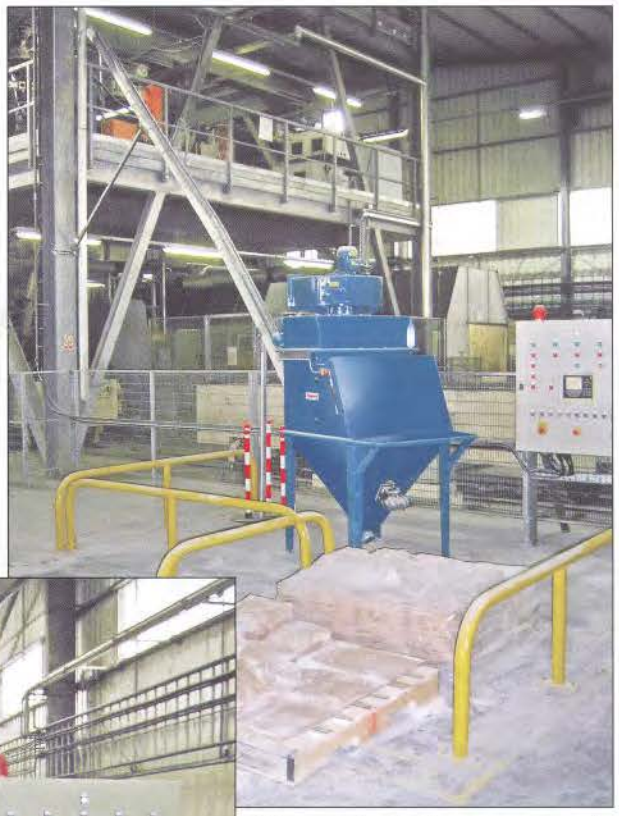
The aluminium powder was added last, a manual and potentially hazardous procedure that required the operator to transfer bags of powder from a storage area to a weigh station on the plant floor. Multiple batches of the powder were then weighed, re-bagged and carried to the blender, via several stairways, in readiness for adding to the mix. Extra bags of powder usually were prepared and held in reserve in case of spillage or loss.

The weighing, transferring and dumping of material by one operator required two hours and generated dust, calling for an overhaul of the process, but switching from 25kg to bulk bags was not an option; the aluminium powder has the characteristics of a semi-free-flowing material, and tends to pack, cake, smear, rat hole and even solidify, limiting its shelf life and offsetting any benefits of purchasing the material in bulk containers.

To improve handling of the powder, H+H Celcon purchased an automated weigh batching system consisting of a bag dump station, flexible screw conveyor and receiving hopper and controller, from Flexicon (Europe) Ltd.

The operator now moves bags from pallets adjacent to the dump station, onto a bag support tray, splits the bags and then dumps them into a 225-litre receiving hopper. A screen installed across the hopper's opening prevents bag scraps and other oversize particles from entering the process, while a side-mounted vibrator promotes uninterrupted flow of material into the intake adapter of the conveyor. The hopper is also equipped with a sensor to alert the operator to a low-level status.

The bag dump station is equipped with a high-velocity vacuum fan that draws airborne dust from dumping activities into a built-in dust collector. Short blasts of compressed plant air released alternately at timed intervals inside the collector's dual cartridge filters cause built-up dust on the outer filter surfaces to fall into the hopper.



A nine-metre-long flexible screw conveyor transfers aluminium powder from a bag dump station to a gain-in-weight hopper on the mezzanine.

(left) Dust generated by operator splitting and dumping bags is contained by dust collector of bag dump station.

The weighing, transferring and umping of material by one operator required two hours and generated dust, calling for an overhaul of the process.

The upper flexible screw conveyor transfers aluminium powder from the bag dump station to the top of a weigh hopper, while the conveyor below feeds weighed batches to the blender.

The aluminium powder has the characteristics of a semi-free-flowing material, and tends to pack, cake, smear, rat hole and even solidify.

Powder then is transferred from the hopper up a 45-degree incline through a nine metre long flexible screw conveyor, consisting of a self-centring screw that rotates within an enclosed plastic tube. At the opposite end of the conveyor, the powder discharges into a weigh hopper equipped with a second, horizontally oriented two-metre flexible screw conveyor installed at the hopper's outlet.

The hopper-conveyor assembly is mounted within a support frame on load cells that transmit gain-in-weight data to a programmable controller. The inclined conveyor discharges material into the weigh hopper until the hopper gains 30kg, at which point the controller stops the conveyor.

The horizontally-oriented conveyor then feeds material into the blender at a steady flow rate to prevent the rapid influx of material that would occur through a slide gate positioned directly above the blender, and continues to run until the weigh hopper's load cells indicate zero net weight.

According to Flexicon, the system has provided great benefit by not only fulfilling local health and safety requirements, but also by increasing production efficiency, since the operator is able to attend to other tasks during the material handling process.

Contact: sales@flexicon.com.au