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Ash Grove restores material flow with Posimetric Feeder

Ash Grove Cement's Leamington, Utah plant chose to confront a problem that has long posed a challenge in cement production: material handling. Although improvements in storage bunker designs and conveyance systems have helped to alleviate many problems, the traditional feeding devices used for the delivery of coal to pulverizers and of raw product to mills are universally prone to plugging and damage. As a result, they represent a high-maintenance item that can limit production runs and kiln availability.

Ash Grove's Leamington Plant Engineer Alan Finch sought to improve the reliability of feed systems at that 840,000-tpy facility. After evaluating alternative equipment designs, he contacted Pennsylvania Crusher, the manufacturer of a device called the Posimetric Feeder. Although this equipment had established a 10-year track record within the power generation industry, it was virtually unknown among cement producers. Seeing that the Posimetric concept offered advantages over other designs, Finch and his colleagues investigated the feasibility of retrofits of the plant's coal feeders and raw material feeders with the Posimetric Feeder.

Several features distinguish the Posimetric design from other feeding technology. Self-cleaning, the positive-displacement device has only one internal moving part consisting of two or more disks connected to a hub to form an internal rotating spool with duct(s). Material entering the feeder becomes locked between the disks and is conveyed around to a discharge point as the spool rotates. By design, there is no motion of the material relative to the hub, and the slow rotational speeds (0.5 to 15 rpm) make the machine virtually maintenance free. The positive displacement action consolidates the material as the spool rotates, providing a metered output in linear proportion to rotational speed.

Ash Grove selected a Posimetric Feeder with a single-duct spool and a separate live-wall hopper to replace a rotary system feeding and sealing the coal pulverizer. The new machine's 10- × 20-in. rectangular inlet and compact profile make it adaptable as a replacement for the rotary feeder. Although interested as well in replacing the triple-gate used to feed and seal the raw product mill, Ash Grove plant personnel chose to first evaluate the performance of the new feeder in the coal-handling system.

Following installation of the Posimetric Feeder in spring 2000, Ash Grove readily noted the benefits of the new system. Within the first year of operation, feeder repair costs had been sharply reduced and only five work hours of preventative maintenance—consisting of routine lubrication—had been required. In addition to reducing the constant maintenance and repair associated with the rotary feeder, the Posimetric Feeder provided greater control over fuel-delivery feed rate, thus improving pulverizer grinding efficiency and burner operation.

A cutaway view shows the path of material through the Posimetric Feeder, which is not subject to plugging and steadily transports material with no fluctuation of feed rate.

Following this, Ash Grove and Pennsylvania Crusher evaluated the triple-gate valve used to seal the 250-tph raw mill. In view of the continuing problems it posed for the facility, requiring more than 740 work hours per year for maintenance, Finch and company decided to replace the triple-gate with a Posimetric Feeder.

Mixing various amounts of rock, sand, shale, and mill scale as dictated by the desired product chemistry, the Leamington plant fed the material through the triple-gate in order to prevent excess air infiltration into the milling process. Since the Posimetric Feeder depends upon the standing column of material to seal against pressure differentials, an independent test of the permeability of the raw product was conducted to assess air leakage. When air leakage figures were found to be well within Ash Grove tolerances, a Posimetric Feeder with a three-duct spool was ordered for the 2001 spring outage.

The feeder's square inlet opening of 36 in. and short inlet to outlet centerline offset of 20 in., combined with a low profile, enabled it to directly replace the triple-gate feeder with minimal effort. The Posimetric design, by contrast to the triple-gate, has substantially decreased feeder downtime, maintenance, and repair. Additionally, because the seal is never lost—as is often the case with triple gates—airborne dust formerly generated by the dumping action of the triple-gate has been eradicated. Consequently, the plant was able to eliminate the dust collection pickup point previously required.

Although the design of the Posimetric Feeder would seem to make it nearly indestructible, early inspection of the machine revealed higher-than-expected wear rates for some of the internal surfaces subject to friction. Further investigation indicated that the quartzite impurity contained in the limestone rock had a highly abrasive effect on internal wear surfaces constructed from carbon and stainless steel materials.

The engineering and maintenance team at Leamington encouraged Pennsylvania Crusher to accept wear as a "given" and to assist in making the machine easier to rebuild. In response, Pennsylvania working with the Leamington plant crew developed a two-part program focused on finding more abrasion-resistant materials to extend the service life of wear components and configuring the feeder to facilitate in-situ component replacement.

Testing and evaluation of various types of abrasion-resistant materials resulted in a machine that now utilizes AR liners and chrome carbide weld overlay for those parts most susceptible to wear. In addition, a segmented body construction facilitates maintenance by enabling part replacement while in place.

After 20 months of operation, Don Summit, current plant engineer succeeding Alan Finch, offered his assessment following review of the feeder's inspection records: "The feeder is running great. Still showing no appreciable signs of wear, the system's parts-replacement cycles may be expected to run well in excess of two years of service." Projections indicate that the Posimetric Feeder will reduce annual maintenance costs by about 700 work hours while helping to improve mill availability. CA

This article was adapted from material supplied by Pennsylvania Crusher, Broomall, Pa., (+1) 610-544-7200.