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Even when it enjoys a healthy market share, what organization can afford to ignore 200 hours of unscheduled downtime and associated labor and material costs annually?

Continual particulate buildup on this kiln pre-heater ID fan rotor (and repeated unscheduled shutdowns to deal with it) impacted Castle Cement's ability to meet production demand. A new balancing system, capable of withstanding the harsh conditions surrounding the unit, now continuously monitors vibration levels and makes rapid corrections while the fan is running.

When your company is responsible for supplying 25% of the cement used in the UK, a smoothly running production process is critical to success. That's why having to go off-line for about 200 hours each year for unscheduled kiln shutdowns can be so costly to an operation. Such was the case for the Ketton Works plant of Castle Cement ("Castle") in Lincolnshire. Open since 1929, the plant now has an annual production capacity of 1.3 million tons of clinker per year, or 4,200 tons per day. Despite the high demand, production operations haven't always run as smoothly as they could. To be specific, the site's kiln pre-heater ID fan suffered from a continual buildup problem stemming from dust and particulate exiting the pre-heater with the hot gasses that are then drawn through the fan. The particulate would stick to the fan rotor, causing it to become unbalanced- *especially when large chunks of the buildup would break off.*

In 2005, the buildup became so great that the fan reached excessive vibration levels on multiple occasions. This led to unscheduled shutdowns for grit-blasting and cleaning about once a month. That year alone, the resulting downtime totaled more than 200 hours. By the time the Castle team reheated the kiln and restarted operations after each cleaning process, significant labor and materials would have been expended-and countless hours of production lost. Furthermore, the kiln's protective refractory lining also was being subjected to failure because of the repeated heating and cooling of these unplanned fan shutdowns.

"Shutting down is a serious process that typically takes several hours to allow the kiln to cool off, and another couple of hours to conduct the cleaning process," says Mike Hart, a mechanical engineer with Castle. "But, our only other option was running the fan at reduced speed, which also greatly decreased our production capacity. Regardless of the solution, the staff often was taken away from regular duties to troubleshoot vibration problems."

Searching for an answer

Castle had begun looking for a balancing solution in 2000, but hadn't found what it needed. By the time operations manager Mark Cox joined the company in 2003, the problem was seriously impacting production. Fortunately, Cox remembered reading an article about a technology that might be able to resolve the situation. Castle contacted LORD Corporation ("LORD") and Andy Winzenz, LORD sales manager, with the UK Distributor TEVA.

Winzenz visited the plant and confirmed that the main problem was in fact the product buildup in the kiln ID fan. "The cement manufacturing process is dependent on the performance of the ID fans and the ability to maintain process air fl ow," he notes. "Our goal was to implement a solution to keep the fan running smoothly and reduce kiln downtime."

After analyzing the problem and the fan specifications, the recommendation was to install a permanently-mounted device that continuously monitors fan vibration levels and corrects for unbalance while the fan is running. Although LORD has a variety of vibration control products, this particular type of balancing system was recommended because of its ability to make rapid corrections and withstand the harsh environment surrounding the ID fan.

The system is set up to monitor fan bearing vibration levels and the vibration phase angle in order to automatically correct for unbalanced conditions. This is done while the fan is running at operating speed, eliminating costly downtime to clean and manually balance the unit. Once levels reach a pre-set high trip point, the system switches on, commanding balance mass inside the shaft-mounted system to adjust as needed to counteract the unbalance and reduce the vibration.

The balancing ring of the system mounts directly to the fan shaft and houses counterweight masses that can be repositioned to offset the unbalance detected in the fan rotor. Utilizing vibration sensors, the system monitors the fan bearing vibration. Vibration signals are received

and processed by an "Adaptive Infl uence Coefficient" control system, which then determines the balance adjustments that are required. The controller relocates the counterweight masses to the desired position to minimize the vibration levels. This process continues until the controller senses that balance has been restored. Typical balance cycle times range from 30 to 120 seconds, depending on operating speed.

LORD developed and patented the actuator coil assembly used in their balancing system. The actuator coil is traditionally mounted to support brackets located on the bearing pedestal. The non-contact power supply used in the actuator coil eliminates the need for maintenance, sending power across an air gap between the stationary actuator coil and the rotating balancer ring.

Implementing the solution

According to Mike Hart, Castle opted to install the balancing system during a regularly scheduled shutdown in February 2006. The two-plane balancing system was installed on the company's #8 Kiln ID Fan (Solyvent Fan), which is part of a 3,000-ton-per-day process. The installation, performed in concert with the TEVA organization, involved moving the motor out of the way, pulling the coupling and bearings off the fan shaft, installation of the balance ring, reassembly of the bearings and coupling and then reinstalling and aligning the motor. Other tasks, such as running conduit and cables between the balancer and the controller and mounting the controller in a dustproof, waterproof box near the fan, were completed in advance of the shutdown.

John Hall, TEVA's business development manager points out that although Castle was confident the balancing system would counteract the vibration problem, nobody was sure how long it would be before sandblasting was necessary. As such, operations manager Cox and his staff watched the buildup rate very carefully. Luckily, the new system proved so effective in correcting the unbalance that in the first six months of operation, the maintenance team experienced no unscheduled shutdowns at all.

"Building on this success," says Hall, "we are in the midst of installing and commissioning a single plane balancing system on Castle #7 Kiln ID Fan (F.L. Smidth Fan), which is part of a 1,200-ton-per-day process."

Proof in the numbers

The results of the project are compelling. Hart says that this process improvement has added

up to big savings for Castle, and it paid for itself in just six months. Not only is the plant now able to run the kiln with no unscheduled production interruptions, it also is greatly extending the life of its equipment and minimizing wear and tear on the fan bearings.

The vibration figures speak for themselves. Before installation of the new balancer, the fan registered as high as 9-millimeters-per-second within 30 to 60 days of sandblasting. Today, however, Castle reports vibration levels of less than 2.5- to 3- millimeters-per-second within the same timeframe thanks to the fan balancing system.

Winzenz says that Castle Cement's success is no aberration, either. Rather, it's just another example of the returns that are achievable from this fan balancing system. Dozens of installations of the system on kiln ID and preheater fans in the cement industry, he explains, have proven that thousands of dollars per year in maintenance costs and lost production can be saved. This solution to a chronic problem is allowing individual plants and the industry as a whole to recognize increases in production that allow them to meet new demands. **MT**