Essroc's raw feed production increased with new liner system

Plant engineers and production superintendents are always looking for new ways to increase airflows in order to maximize their production capacity. It is known that diminished airflows in the manufacturing of cement caused by leaky ductwork and undersized fans can have a negative impact on productivity and profitability.

In 1998, Essroc Cement Corp.'s (part of the Italcementi Group) Nazareth Plant I, located in Nazareth, Pa., with a rated clinker capacity of 1.1 million tpy, was dealing with a reduction of raw feed production estimated to be between 2% and 5% due to the loss of air velocity in its raw mill operations. The raw mill fan was rated at 295,000 cfm, but due to years-worth of ductwork wear, its operation was significantly reduced. The loss of negative pressure decreased the rate of raw feed going into the mill, thereby having an impact on the amount of material going to the kiln.

Upon closer examination of the production process, the plant engineering staff determined that a critical 48-degree elbow between the raw mill and the electrostatic precipitator was causing the diminished airflows. This 8-ft-diam elbow not only carried limestone dust but also had a second source of kiln dust that was introduced into the air stream. This combination of highly abrasive fines and elevated temperatures riddled the elbow with holes. Plant maintenance regularly patched the elbow with abrasion resistant steel plates and ceramic wearing compounds, spending roughly 140 workhours per year on the problem.

Composite technology

Essroc called in The A.J. Weller Corporation to help. With more than 20 years of engineering and advanced technology, A.J. Weller's composite technology merges a diverse number of materials into a specific application, thereby utilizing expensive materials only in critical areas that reduce the overall cost.

A.J. Weller also is the exclusive North American distributor and technology partner for WellerDensit, a product developed in Denmark by Densit a/s. It is a chemically bonded ceramic compound designed for fine particle abrasion applications. WellerDensit is a mixture of ceramic materials and wear-resistant aggregates that create a trowel-able, cast-able, or spray-able liner for wear protection areas.

The product is prepared by mixing the WellerDensit compound with a small amount of water in a special paddle pan mixer. This starts a chemical reaction that hardens the product to a solid, ultra-dense state. Typically, WellerDensit sets in 45 minutes and reaches working hardness in one or two days depending on temperature.

Essroc believed that by utilizing this product on their raw mill elbow, it would stop the leaks and increase the airflow. A WellerDensit wear liner makes use of a mechanical bond in the form of an expanded metal mesh that is then welded onto the steel surface to be protected. The difference in thermal expansion between steel and the ceramic composite material become absorbed so broad cracks and the risk of spalling is avoided

The product is self-supporting due to its strong mechanical properties. In many cases, it can be applied to worn parts thereby eliminating the need to fabricate a new support structure. This allows the liner system to be applied seamlessly to complex geometrical shapes during field installation.

The standard WellerDensit products—Wear Flex 1000 and Wear Flex 2000—can handle temperatures as high as 750°F (400°C). Wear Flex 2000 HT can be used to 2,190°F (1,200°C). WellerDensit takes thermo shock and heavy sporadic impact much better than hi-alumina ceramics and will outwear cast basalt in most applications, according to its manufacturer.

Spring 1998 shutdown

During the 1998 spring shutdown, the raw mill elbow was lined with Weller Wear Flex 2000, a process that took place over seven days. A.J. Weller provided a technician to oversee the installation and train a local refractory company hired by Essroc. Internal staging was used to aid in the installation. Prior to installation, the existing liner system, a combination of a ceramic and a wear resistant compound, was removed. Then the components of the anchoring system were welded into place. It was determined that minimal metal work was needed because WellerDensit added structural strength to the substrate. A 1¼-in.-thick liner was deemed appropriate for the job and was installed.

Essroc Cement Corp.'s 1.1 million-tpy Nazareth (Pa.) Plant I

This 8-ft-diam, 48-degree elbow between the raw mill and the electrostatic precipitator was causing diminished airflows.

Spring 2003 shutdown

The Nazareth Plant I is in the process of modifying its dust collection system. During the 2003 shutdown, the raw mill elbow was lowered to the ground to allow for a modification in the ductwork leading into the precipitator. This gave plant personnel an opportunity to inspect the raw mill elbow and make any necessary repairs before being lifted into place. A minimal amount of repairs were needed to restore the elbow back to its original WellerDensit liner condition. This was accomplished by using a small amount of material and completed within an eight-hour window using a local mechanical maintenance contractor.

Results

"Keeping the ductwork intact by eliminating leaks from abrasive wear has improved the clinker production in the kiln. It also allows the precipitator to run at peak efficiency," said Nazareth Assistant Plant Manager Tom Bizup. "Although this large elbow duct is not the only area of outside air infiltration, it was a large contributor of the infiltration. Closing all the areas of infiltration increased our raw feed production approximately 2% to 5%, or 22,000 to 55,000 tons."

The plant engineer added, "After five years, the WellerDensit held up so well rarely did we have any leaks or holes in the elbow, and it looked like at least 75% of the WellerDensit was still intact. I'm expecting to get at least another five years before any liner replacement is necessary. I have started to install the liner on other areas of the duct where wear holes appear."

"I'm also looking at other ductwork wear points that WellerDensit can help eliminate continuous repairs, and on other pieces of equipment that have high-wear but low-impact applications, which include the finish mill inlet cone, the classifier housing and outlet transition duct, and the precipitator plenum area."

This article was adapted from material supplied by The A.J. Weller Corporation and WellerDensit, www.ajweller.com