

Lafarge sees no end to slag cement growth

Lafarge North America's South Chicago slag grinding facility recently completed its first year of operations, at a time when the use of slag cement in the United States is accelerating at its fastest pace in history. The environmentally friendly process — which converts the byproduct material from steel manufacturing — uses 100 percent recycled materials and significantly enhances performance when blended with ordinary cement. Lafarge and other members of the **Slag Cement Association** shipped a record 2.9 million metric tons in 2002, a 22 percent increase over shipments in 2001. This growth is particularly impressive since overall portland cement shipments decreased about 4 percent in 2002.

Lafarge built the South Chicago facility after making arrangements to take slag from the Ispat/Inland Steel mill in nearby East Chicago, Ind. The deal saves Ispat the cost of hauling and disposal of the slag in landfills, while Lafarge gets a steady material source that it processes using less energy than a conventional cement kiln. Since the extreme heat of steel blast furnaces cooks the slag before it arrives at Lafarge's grinding facility, the plant uses virtually no heat to create the cement, thus reducing greenhouse emissions.

By April 2003, after one full year of operation, the facility had processed about 120,000 metric tons of slag and produced 110,000 metric tons of its NewCem-brand slag cement. As a company, Lafarge North America has an annual capacity of more than 2 million metric tons of slag cement from its facilities in South Chicago, Florida, Maryland, and Canada, making it the production leader in North America. Of its cementitious material production, slag cement accounts for 7 percent of the company's business. But with an aggressive promotion and marketing effort currently under

way, Lafarge expects that number to increase to as much as 15 percent in the next two years.

As part of the company's commitment to being environmentally friendly, Lafarge built the South Chicago plant in the heart of the Midwest's steel-manufacturing region to ensure a reliable supply of raw material and to keep transportation costs low. The plant is also located near major water ways to allow the end product to be shipped by barge — a shipping method requiring less fuel than other alternatives, such as rail — across the Great Lakes region and as far south as Nashville.

PROMOTING THE BENEFITS

Slag cement blends can be used for virtually all types of cast-in-place concrete, along with manufactured products such as block, segmental retaining wall units and pavers. Dye and pigments are more readily accepted by cement made with slag, and self-consolidating concrete is reported to be more efficient when using a slag

Located at the southwest foot of Lake Michigan, the South Chicago cement terminal (below and lower right) and NewCem processing plant and terminal (lower left) form a key material transfer and distribution point for Lafarge's Great Lakes and Midwest region customers.



PH0105: Concrete Products

Lafarge devotes 85 percent of its granulator output at the East Chicago operation to NewCem slag cement. Following transfer from live stockpiles (below) to longer-term storage, granules are trucked just over the Indiana-Illinois border to the South Chicago grinding plant and terminal (preceding page). Remaining granulator and material-handling capacity is earmarked for True Lite aggregate, which Lafarge has recently introduced to block and concrete producers.



blend. According to Michael Baker, technical sales representative for Lafarge's cement division, the company recommends no more than 35 percent replacement be used in such mixes, but some jobs in Europe have gone as high as 75 percent. Currently Beloit, Wis.-based **Mid-States Concrete Products** buys bulk NewCem to make hollow-core precast planks using a 15 percent slag mix. Baker says the project is in the ramp-up phase, and eventually Midstates will up the replacement percentage to 35.

One of the earliest uses of NewCem was in the production of precast and prestressed concrete, although there were some initial concerns using the product for these applications because of the material's natural tendency to reduce the early strength of the concrete. It was shown, however, that NewCem reacts well when concrete is cured at elevated temperatures; therefore, early strength of the concrete is seldom a concern for these applications. NewCem is also said to reduce the permeability of the concrete, which reduces the amount of water that is available for alkali-silica reactions.

SOUTH CHICAGO PLANT

The largely automated South Chicago operation employs 12 workers to process an annual output equivalent to that of a mid-size cement plant. Finished product is distributed via a network that includes Lafarge's Alpena, Mich., and Joppa (Grand Chain, Ill.) portland cement plants.

Within 24 hours of leaving the granulator at the Ispat Inland steel mill, the raw slag material is brought the 16 miles from the steel mill in 25-ton dump trucks at about a 12 percent moisture level. Raw slag from Ispat is brought in during off-peak traffic hours, usually from 5 p.m. to 5 a.m., so as not to interfere with the outbound

shipments of slag cement and conventional portland from a companion terminal. Material is deposited in a 1,250-ton steel storage bin before it begins to be processed. The slag must be moved through the plant almost immediately upon arrival since the material will harden if it cools too much. Because of the abrasive nature of the product, most of the plant's major equipment was treated with customized wear protection. For example, the numerous Aumund-made bucket elevators had to be rubber lined or the slag would eat through the metal.

Once the material's moisture content is reduced using natural gas-fired heaters and a series of fans and cyclones, the slag is sent through a 17-meter-long × 5.7-meter-diameter Polysius roller mill, said to be the largest slag mill in the United States. The grinding media (supplied by Magotteaux) are smaller than those you would find in a portland cement roller mill since slag cement needs to be finer in size.

The finished material goes into a pressurized building via air slides and is sent from there either to a barge or to one of nine distribution silos contained in a 36,000-ton-capacity main storage silo. Built by Greycor, the main, 192-ft.-high NewCem silo holds 8,000 tons of finished product and is linked to two truck-loading bays. Although no actual blending occurs on site, the other eight bins store portland cement from the Joppa and Alpena cement plants. All controls for processing and distribution are located in a single control room.

Automatic product samplers from Inter-Systems are positioned throughout the plant and material is monitored by the quality control lab every two hours for fineness, chemistry, glass content, ASTM requirements and moisture (on incoming raw material).

Reprinted with permission from the June 2003 issue of *Concrete Products*® (www.concreteproducts.com) Copyright 2003, PRIMEDIA Business Magazines & Media Inc. All rights reserved.