# Beneficial Use of Dry Scrubber Ash in Mainline Asphalt Paving

*By Travis Collins*

The ultimate win-win equation for beneficial use of CCPs in construction is to improve quality, reduce cost, and conserve other resources. The use of fly ash in concrete has achieved these simultaneous goals for over 50 years and is now an essential product in the construction industry. Another encapsulated application with potential for increased utilization is the use of CCPs in asphalt paving, specifically in specialty, high-performance mix designs called stone matrix asphalt (SMA).

## SMA Mix Design

Stone matrix asphalt is a specific mix design that originated in Europe in the 1960s and has seen steady growth in the United States over the past 30 years. SMA mixes are designed to be more durable and provide longer-lasting surfaces that are more resistant to rutting. Beginning with pilot projects in a few states, use of SMA has grown to include annual paving programs by several state DOTs, including Oregon and Georgia. There is a higher initial cost to produce and place SMA over conventional hot-mix asphalt, but several DOTs recognize the life-cycle cost benefit of using SMA, particularly in areas of high truck traffic.

The SMA mix design is unique primarily due to the higher proportion of coarse aggregate designed for increased stone-on-stone contact. This high-stone mix is held together by a binder of asphalt cement that is enriched with a mineral filler

NMC supplied 750 tons of dry scrubber ash for this stone matrix asphalt paving project on I-94 in central Wisconsin.

to increase viscosity. The fine particle sizing of fly ash is often used as the preferred mineral filler to increase the viscosity of the asphalt cement paste, which lessens the drain down of this binder due to a mix intentionally deficient in fine aggregate. Other bulk powders such as dry scrubber material or cellulose fibers can also be used as the mineral fillers in SMA.

Dry scrubber ash is the residual material created from the combination of fly ash and the reagent lime from the dry scrubber unit used to absorb acidic exhaust gases. The residual ash/lime is stored dry in a silo at the power plant. This material is often high in sulfur and calcium, making it useful to improve soil characteristics in agriculture. But due to seasonality and competition with other fertilizer products, dry scrubber ash is often in surplus at power plants. Finding other beneficial use outlets where there is a cost benefit and an encapsulated end use can be a challenge for utilities.

National Minerals Corporation (NMC) has supplied fly ash and dry scrubber ash produced at several different generating stations for mineral filler in various stone matrix asphalt projects in the Midwest over the past 10 years. The particle sizing and spherical shape of fly ash work very well and it is almost universally accepted. That said, the size, shape, and chemistry of dry scrubber ash vary from plant to plant. Since each scrubber unit and plant setup is somewhat unique, dry scrubber ashes are not all equally acceptable and require job-specific testing to verify compatibility. If the dry scrubber material is compatible with the asphalt plant setup, storage, weigh scales, and feeder systems, then it can make an excellent, cost-effective, fully encapsulated mineral filler in SMA paving.

## I-94 SMA Paving Project

This past summer, NMC supplied 750 tons of dry scrubber ash for an SMA paving project on I-94 in central Wisconsin between Tomah and Sparta. The dry scrubber ash was sourced from the John P. Madgett Station (Dairyland Power Co-op), in Alma, Wisconsin, for the mineral filler portion of the SMA mix. Mathy Construction Co., which has significant experience in designing, batching, and paving SMA mixes, was selected to perform the work. Mathy's material handling experience and a plant designed for accurate metering of the dry powder into the mix yielded very consistent production and placement of the SMA mix. Use of a locally available surplus CCR reduced project costs and resulted in an effective encapsulated beneficial use.

Asphalt paving schedules are often difficult to service because of the high daily volume demands and potential for short-notice delays due to weather and other unforeseen variables. However, with adequate on-site storage, these projects can be successfully supplied with CCRs from nearby power plants. With fly ash having a higher-value end use in concrete, and seasonal production often committed to concrete producers during the construction season, using alternative CCRs such as dry scrubber ash in asphalt can be a win-win equation for the utility, the contractor, and the owner of the project.

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