

Fly Ash Sales are a Win-Win-Win

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For the past two years, South Mississippi Electric has produced a combination of revenues and savings from an unexpected source—the recycling of fly ash, which is a by-product of burning coal at Plant Morrow. Not only is the process profitable, but it also provides positive environmental benefits and is a boon to economic development in the state and region.

American coal deposits, depending on where they are located and how they were formed, have widely varying chemical properties. There are differing levels of carbon, sulfur, nitrogen, moisture, and other components that contribute to a coal's performance, as well as its post-combustion emissions. Boilers at electric generating plants are designed to use certain kinds of coal. Plant Morrow burns bituminous coal that originates from eastern Kentucky and Virginia. The coal is relatively low in sulfur and ash content and high in heat (BTU) content.

As part of the Clean Air Act and other federal and state environmental regulations, coal-fired generating facilities must limit emissions of sulfur- and nitrogen-based components, as well as particulate matter. Morrow typically burns approximately one million tons of coal each year. With an ash content of roughly 9½-11 percent, that means more than 100,000 tons each year must be extracted from the plant's exhaust gases and disposed of properly.

"Since the plant began operation in 1978, we have placed a large amount of fly ash in a landfill located on our property," said Plant Manager Charles Stuart. "The facility covers nearly 50 acres and is maintained according to strict regulations. The process requires a good deal of manpower and machinery, as well as constant oversight to ensure that we are in full compliance with all landfill regulations."

Fly ash, however, has a number of possible industrial uses, primarily as an ingredient in concrete products. Depending on where and how it is used, concrete requires varying specifications for its ingredients. Plant Morrow's ash has ideal characteristics, and for many years plant employees have searched for ways to market the ash.

"In previous years, we had only limited success," said Stuart. "We had a couple of contractors who were able to market the ash prior to 2003. Markets were limited, however, and revenue was minimal; but any sale reduced the amount placed in the landfill."

In the mid 1990s, Separation Technologies, Inc. (STI), a large regional company, perfected a process of conditioning fly ash to meet the quality and consistency required for use in the concrete product industry. At the time, the process was not economically feasible at Plant Morrow. In 2003, new discussions began and an agreement was reached in 2004. STI received exclusive rights to Morrow's dry ash and began selling the product commercially in January 2005.

The fly ash is collected from Morrow's boiler exhaust gases by electrostatic precipitators, which use electric charges to attract the very light, very small ash particles. A vacuum system collects the ash and a pressure system transfers the ash to a storage silo. From there the material is transported to STI's patented processing facility, where positive and negative charges separate the ash into two streams, one high in carbon content and one low in carbon.

The high-carbon stream is returned to the plant to be burned with the coal, saving approximately \$80,000-\$100,000 monthly in fuel that would otherwise be lost—equivalent to a trainload of coal each year. The low-carbon fly ash stream goes to STI's product storage silo, where the material is kept until being shipped via tanker trucks to customers.

In 2007 and 2008, STI sold more than 85% of the fly ash produced by the plant, generating revenues for SME of more than \$300,000. Customers include numerous Mississippi Department of Transportation contractors who are rebuilding roads and bridges, including those destroyed by Hurricane Katrina. The price of the ash is adjusted annually according to contract specifications and market conditions.

Although the funds generated from the sales are a new source of revenue, an even greater benefit comes from the savings of not having to handle and landfill the ash. Current costs average about \$7 per ton to develop, fill and maintain the landfill. By avoiding landfill costs, reclaiming the unburned carbon and selling 85,000 tons of treated fly ash per year, the ash handling program creates a total annual savings of more than \$1 million. The recycling is also helping to reduce the amount of solid TRI (Toxic Release Inventory) elements—including mercury and compounds of lead, manganese, and antimony—going to the landfill.

"This is an excellent example of finding a way to do something better," said Stuart. "Many employees had a hand in getting us to this point, as did the STI employees. From the standpoint of daily operations, we continue to work very closely with STI personnel so that they can follow how the plant is operating, whether it is going 24/7 during the summer or much less than that during outage periods."

ANATOMY OF A LANDFILL

Roughly 75 acres of Plant Morrow's approximately 1,000-acre site are permitted by the Mississippi Department of Environmental Quality (MDEQ) as a disposal site for the by-products of burning coal. Roughly 49 acres on the south side of Okahola Road are currently developed and in operation, while another 26 acres on the western side of the plant are permitted for potential future needs.

To date, more than two million tons of fly ash have been transferred to the landfill, which is constructed and maintained according to regulations. The ash is transported by a conveyor system and bulldozed or moved around the site by heavy equipment. Solid waste landfills require a liner beneath the by-products to ensure that the stored material does not leach downward and impact the ground water below. The liner method used at Morrow consists of a two-foot-deep, low-permeability clay layer with an 18-inch-thick sand layer on top of the clay.

Numerous other protective actions are conducted regularly. Water that normally leaches down through the by-products must be pumped periodically to maintain the base liner's integrity. Monitoring wells around the edges of the landfill are sampled and analyzed twice each year by an independent third party to make sure that nothing from the landfill impacts ground water in the area. Rain runoff is channeled around the landfill to a pond filled with cattail vegetation, where the slow water velocity and the filtering effects of the cattails cause any ash particles to settle out before the water discharges into nearby Black Creek. The solid particles in the pond are excavated periodically and returned to the landfill.

The current permit allows for the landfill height to reach approximately 95 feet above the surrounding ground elevation. Presently, the elevation is close to 60 feet. Exposed material in the landfill area is kept damp to help minimize windblown particles and about once a year the exposed walls of ash are covered with a layer of clay, soil and grass.