

Chapter 10

Minergy LWA – Structural, Masonry, and Geotechnical Lightweight Aggregates

Introduction

The unique process developed by Wisconsin Electric and its affiliate Minergy Corp. (both companies are subsidiaries of Wisconsin Energy Corporation), in which fly ash, municipal wastewater sludge, and paper mill sludge are converted to an environmentally inert structural lightweight aggregate for use in the construction market was closed in 2000 thus ending five years of quality lightweight aggregate production.

Wisconsin Electric's lightweight aggregate plant, which was located in Oak Creek, Wisconsin, started production in 1994 and was the world's only commercial-scale facility that produced structural-grade lightweight aggregate from coal combustion fly ash and wastewater sludge. The stone-like end product, Minergy LWA™, was suitable for use in a broad range of concrete products and geotechnical applications.

Minergy LWA was sold to concrete producers throughout the Midwest. It is used to reduce dead loads and improve fire ratings of concrete in numerous construction projects. For example, past projects include office buildings in the Chicago area; a student commons facility at St. Olaf College in Minnesota; a hospital in Ft. Wayne, Indiana; Michigan Tech University's Environmental Sciences Building; and in Wisconsin, VA Hospital in Madison, 8th Street Bridge in Sheboygan, and Miller Park, Midwest Express Center and the Hilton Hotel in Milwaukee.

Minergy LWA was also used to produce lightweight concrete masonry. Compared to conventional masonry units made with sand and stone, lightweight concrete masonry has higher fire ratings and higher R-values.

Since lightweight concrete masonry is about 20% lighter than conventional masonry, it is easier to install and transport. Many users report fewer back injuries and fewer complaints due to repetitive motion ailments. Lightweight masonry units are slightly more expensive than conventional concrete masonry, but the cost of a typical wall made of lightweight masonry is generally less, due to increased productivity and lower transportation costs. The life cycle costs are less due to energy savings.

Minergy LWA was also used for geotechnical applications. Lightweight backfill reduces the loads on poor sub-soils thus minimizing settlement. Lightweight backfill behind retaining walls exerts lateral pressures that are 3 to 4 times less than conventional sand, stone or clay backfill. Typical backfill projects include highway embankments, bridge abutments, fill for road construction, segmental retaining walls, and lightweight fill for building structures.

Minergy LWA was also used to produce lightweight soils for roof top gardens and parks such as McArthur Square in Milwaukee, Wisconsin and Monona Terrace in Madison, Wisconsin. The thermal resistivity of Minergy LWA was about 4 times higher than sand or stone and is often used to backfill water mains that do not have adequate cover or to insulate other frost susceptible structures. Lightweight aggregate can be used for perimeter insulation for slabs on grade and building foundations.

The Minergy LWA manufacturing process had numerous environmental benefits. Historically, fly ash and sludge were landfilled at a substantial economic and environmental cost. By utilizing recycled ingredients, the Minergy LWA process not only prevents needless land filling but also eliminates the need for raw material extraction.

Unlike conventional lightweight aggregate manufacturing processes that rely on a large amount of energy to power the process, the ash and sludge provided fuel for most of the plant's energy needs – minimizing the need to consume other resources. Since LWA concrete's R-value (thermal resistivity) is two times higher than normal weight concrete, it can improve the energy efficiency of buildings in which it is applied.

The plant was closed in November 2000 due to competitive pressures for sewage sludge, higher value uses for the fly ash, and to make room for additional generating facilities at the Oak Creek Power Plant.