

# Ceramic Lightweight Aggregate

## Production from fly ash

For decades, coal combustion products (CCPs) have been recovered from power plants and beneficially used in applications ranging from concrete manufacturing to soil stabilization. As the environmental and performance benefits associated with CCP use have become clear, landfilled and ponded CCPs have increasingly been reclaimed for beneficial use.

Boral Resources now offers a technology and service that provides for the manufacture of ceramic lightweight aggregate (LWA) from CCPs generated by current production or recovered from landfills or ponds. The resulting aggregate can be sold and beneficially purposed in a variety of construction, agricultural, and related applications. Additionally, potential costs associated with the transportation and storage of coal ash in a landfill or pond are avoided.

### THE TECHNOLOGY

The heart of the technology involves the use of a high-temperature/high-efficiency rotary kiln to dry the raw materials, typically fly ash. The high-capacity kiln—a counter-current shaft drier with mobile shelves—uses a compact design requiring only a small amount of energy to dry the agglomerates. The sintering operation is autothermal, with external fuel required only to initiate the process.

Process heat is recovered (from flue gases up to 1,000° C), which is partly used for production purposes. Surplus heat can be converted into central heating, hot water, or electricity and sold to generate revenue.

Boral's technology is automated, can be overseen by as few as four people, and allows for setup as a separate or

integrated installation. As a separate installation, a facility is situated outside an existing landfill or pond. As an integrated installation, the operation is incorporated into a power plant and effectively eliminates the production of CCPs as an end product. The latter solution involves a simpler technology layout and lower capital expenditures, while boosting revenues by the sale of the aggregate.

Since 2014, a full-scale pilot plant in Sowlany, Poland, has used deposited coal ash as feed material to produce annual output of 40,000 metric tons of lightweight aggregate. However, the technology allows for the use of a range of other post-industrial and post-consumer materials, including biomass (ash after co-combustion of coal or lignite with biomass); phosphogypsum (deposits of phosphogypsum created in the production of phosphorus acid); municipal waste (ash and slag from municipal waste incineration plants); and mining waste (coal slurry).



*A pilot plant in Sowlany, Poland, produces 40,000 metric tons of lightweight aggregate annually.*

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### LWA BENEFITS

The lightweight aggregate that results from the process is a safe, chemically neutral product with a wide range of uses in concrete manufacturing, building applications, road construction, and gardening. Owing to its physical properties, it has potentially wider application than natural aggregates. Its advantages are in its weight and durability—with a bulk density ranging from 550 to 720 kg/m<sup>3</sup> and a guaranteed crushing resistance of 5 MPa.

The material possesses additional characteristics that further enhance its marketability, including:

- High strength-to-weight ratio
- Resistance to fungi, mildew, rodents, and insects
- Freeze-thaw and fire resistance
- Heat and sound insulation
- Non-degradability/reusability

