



River of opportunity

The mining and processing of expanded clay lightweight aggregate is very different from a typical crushed-stone or sand-and-gravel operation. It presents unique challenges and rewards.

BY DON EBERLY
AND LAURA DROTLEFF

No one can afford to stand still for long in the aggregate industry, and Big River Industries, the nation's largest producer of expanded clay lightweight aggregate (LWA), is no exception. With its largest markets, concrete and masonry, the company is constantly evaluating and setting new goals to streamline its mining processes and employ evolving technology.

Big River Industries operates three mines to produce its expanded clay LWA products, sold to customers throughout the South and Midwest, and elsewhere through exclusive distributors. The aggregates are currently used most extensively in concrete, asphalt, concrete masonry, storm water runoff, geotechnical and horticultural applications.

The company began in 1954 with the production of Gravelite aggregate at its original

location in Erwinville, La. In 1984, Livlite was added with the acquisition of a mine site near Livingston, Ala. Finally, in 2005, Big River Industries purchased the plant that produces Arkalite in Proctor, Ark. Today, the company's annual production capacity exceeds 2.5 million cu. yd. It also markets Class C fly ash – a byproduct of western coal combustion – from its Louisiana facility.

Mining and firing LWA

Big River Industries' mining processes vary between its three locations, mostly owing to climate and environmental factors as well as topsoil quality. Each mine has its own challenges and, due to the varying conditions, requires unique solutions.

In Louisiana, the deposits of interest are Holocene-age alluvium. The alluvium deposits are back-swamp deposits, which are almost

entirely clays and silty clays. These silty deposits have been generated over thousands of years and are mined one mile from the Gravelite processing plant.

Because the mine is at sea level and rainfall accumulates, the operation has 80 to 100 days each year to excavate 600,000 tons of a quality clay product, says Greg Knight, vice president of op-

erations. The Arkalite mine in Arkansas is similar, with a limited timeframe owing to the region's climate. Arkalite mines 550,000 to 600,000 tons of clay annually.

"Our operation requires a great deal of manpower and heavy equipment to bring in the volume of clay we need in the short window of time Mother

Nature allows us each year," Knight says. "Our 140 employees work a lot of hours during weekdays and weekends, but we don't mine at night for safety purposes."

At the Gravelite and Arkalite mine facilities, the clay excavation process is fairly simple, using large farm tractors to chop up the clay and allowing the sun to dry it before processing. The tractors pull pans behind them, and operators scrape out the clay and transfer it to the storage facilities. This equipment has proven to be more efficient than the prior methods of using bulldozers to push clay into windrows, scoop it up with a track hoe and transport it to storage with dump trucks.

"The weight of the trucks caused us to have to wait after the rains to re-enter the field," Knight says. "The tractors and pans are designed to distribute the loads more efficiently, allowing our operators to get back into the mine much sooner."

At the Livlite operation in Alabama, where the mine depth is about 100 ft., clay is excavated through a bench mining process using shovels. There the rain doesn't cause as many problems because the area is well drained, allowing Big River Industries the flexibility to mine year round. Because of this, the Livlite mine produces the most aggregate of all three operations, with full production capability ranging from 1 to 1.2 million tons of clay.

When Big River Industries moves to a new area of an existing permitted mine, it facilitates a boring analysis sampling of the topsoil, which reveals any overburden issues. In Arkansas and Louisiana, there are few issues. However, in Alabama the surface strata do not produce good aggregate, causing the miners to have to remove 10 to 15 ft. of overburden, at significant cost. Knight says once the miners have reached the actual clay deposits, the quality is typically good throughout the remaining depth.

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Into the kilns

After the clay is mined and placed in the



At the Arkalite mine, both silos and open stockpiles are used to store and sort the final product.

clay shed for storage, it is picked up via conveyor and moved to automated rotary kilns. The newest automation technologies adopted by Big River Industries have helped set new standards in efficiency for the company, by allowing its kilns

to operate 24/7 and to burn 18 to 22 tons of clay per hour.

There are 10 coal-fired kilns total in all three operations, ranging in size from 8 to 14 ft. in diameter. Clay is deposited into the back of the kiln and fired at

2,000° F, turning constantly. It takes 45 minutes for the clay to travel from the feed end to the discharge end. Knight explains that the automation has not only helped set new production goals, but provided a more consistent, reliable product.

After kilning, the calcined aggregate is a molten material at 1,800° F. From the kiln discharge, the material falls into grate coolers, and ambient air cools it. Once cooled, the material can be moved via conveyor belts to be processed to precise gradations at the crushing and screening stage.

Recently, Big River Industries changed its process from using mild steel for hammers and arms on its crushers to a new material that lasts longer to extend the life of these critical tools. It also changed from using wire mesh screens to polyurethane screens to eliminate fugitive emissions from dust and the associated complications, Knight explains.



LAND/RESERVES PURCHASE

NRP recently acquired and leased back reserves in North Texas to assist in the development of a greenfield limestone operation, and also in Southern Arizona to assist in the expansion of an existing sand and gravel operation.

NRP will purchase actively mined aggregate reserves from landowners, as well as from aggregate producers through a sale/leaseback for future royalty payments. All cash purchases, NRP has the ability to close and fund quickly. Funds may be used for recapitalization, partner buy-out, operating capital, equipment purchases, plant expansion, etc.

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“We are crushing and screening a very hot product, so in order to stop the dust we have to fog or mist the product,” he says. “We were seeing blinding of the screens with metal, which creates a paste that contaminates piles and clogs screen holes. Changing to polyurethane screens solved that problem.”

Knight also explains that the polyurethane screens are easier to replace and accumulate less expense over time. The metal screens, ranging in size from 8 x 16 ft. to 8 x 20 ft., would need to be replaced entirely for even the smallest hole. Polyurethane screens are made up of 1-sq.-ft. panels, so only a single panel would require replacing.

To meet precise client needs, Big River Industries has opted to have each LWA particle size stockpiled on site in silos or open stockpiles. Each silo or stockpile is above a chute that opens to a tunneling system leading to a conveyor belt, which transports material to

trucks or railcars for shipping.

“If a customer just needs the 5/8 gradation, the operator opens that chute

and the single size falls onto the belt,” Knight says. “If there is a blend needed, the chutes open for each size, and they



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mix on the belt on the way to the truck.” As trucks are loaded, mixes are sampled and compared to customer specifications; any adjustments are made quickly before loading commences.

For quality control purposes, most samples are run through an automated sieve analysis machine. This process requires little manpower, and the results can be printed or e-mailed directly to customers should the request for one be made. In most cases, loads are checked, ensuring the company is shipping quality product to every customer. Independent labs test gradations periodically, as well, to certify that Big River Industries’ products continue to meet industry standards.

Creating customer solutions

As with all companies involved with mining and manufacturing, operations have their purpose. Big River Industries markets LWA to a wide range of customers, including concrete product manufacturers, structural and highway

Take note

Big River Industries’ customers can apply for LEED credits through the U.S. Green Building Council, most often earning points for the use of recycled and regional materials.

engineers, contractors, builders, green roof designers, landscape architects and architects. Jeff Speck, vice president of sales and marketing, says the company’s sales team collaborates regularly with production to identify potential new markets and refine processes to meet the needs for new aggregate uses.

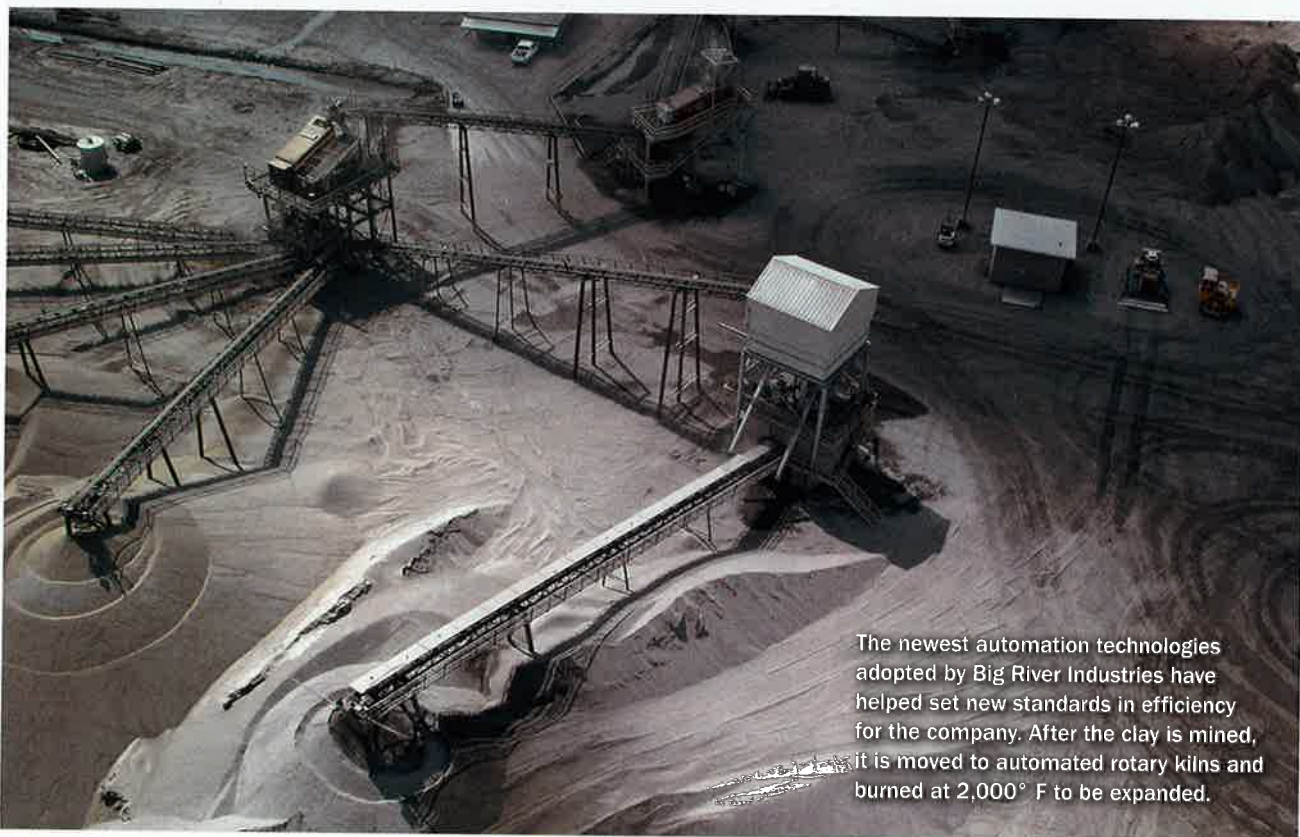
“Each one of the applications using our product has particle size requirements,” he says. “It is our ability to separate those particles and put them back together into customized orders that makes our production unique, and sometimes a challenge.”

For example, a geotechnical order

may request a blend of the largest particle sizes to fill an embankment. Big River Industries’ LWA produces lower and more uniform settlement, and LWA backfills exert much lower lateral pressures against retaining walls and sheet pile structures. A construction engineer may request an order of only the intermediate particles to build lightweight precast and prestressed beams or columns, calling for a blend with the exact ratio of each gradation to reduce the concrete density to ensure lower foundation, transportation and placement costs.

Constructing Q-LITE concrete masonry units requires a blend of the smallest gradation of LWA to produce the lightest-weight blended aggregate units available, combining the benefits of blending with a U.L.-certified fire rating. These extremely lightweight units mean better mason productivity, lower delivery costs and reduced building dead loads.

Due to this critical role of filling spe-



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