



Narration for UK CAER FastFloat Process

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Lexington, Kentucky
Kentucky Ash Education Web Site
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Fast Float is a process developed at the UK Center for Applied Energy Research to separate landfilled coal combustion ash into useful products. To demonstrate the process in continuous operation at the pilot scale, a mobile processing plant was designed and constructed. It was then disassembled and packed into two trailers that were hauled to the edge of a utility ash storage pond.

There the parts were unpacked and re-assembled into the design shown here. This is a processing facility that continually separates ash into several marketable products. Let's take a closer look at how the process works.

We excavated ash from a decanted section of the pond and moved it closer to the trailers. The stockpiled ash was then transferred to the plant with a Bobcat loader. Each scoop of the loader held about 250 pounds of ash.

The loader dumps a scoop of ash into a hopper that feeds a conveyor. The hopper has a sliding gate at the base to control the flow of ash onto the conveyor. It also has a vibrator to keep the ash flowing through the discharge gate. The feed rate varies from 1 to 5 tons of solids per hour, with most testing done at a feed rate of 2.5 tons per hour.

The conveyor moves the ash into a 500 gallon mixing tank. Here water is added to adjust the solids concentration to the desired amount depending on the type of testing being done. Most testing is done with a slurry concentration of 10 to 15% solids.

To keep the solids from settling, the mix tank is equipped with a mechanical stirrer. The slurry is taken from the bottom of the tank and re-circulated to maintain a uniform suspension.

Once the slurry in the mix tank is adjusted to the desired percent solids, it is pumped into another 500 gallon tank which serves as the feed tank to the Fast Float process. As the slurry from the mix tank is transferred into the feed tank, it passes through a screen to remove bottom ash particles larger than $\frac{1}{4}$ inch. This prevents these larger chunks from entering and plugging the equipment's valves.

The coarse particles are removed from the screen periodically. This coarse ash can be used as lightweight aggregate.

As slurry is withdrawn from the feed tank and pumped into the process, additional slurry is added from the mix tank to make sure there is always enough slurry to keep the process running. Once the mix tank is empty, another scoop of ash is fed onto the conveyor and another batch of slurry is prepared.

The slurry is pumped from the feed tank into a hydraulic classifier, which is the black tank shown here. The hydraulic classifier separates the ash into two products based on size. Ash coarser than 100 mesh or 150 microns settles to the bottom where it is removed with a pump.

High carbon fuel can be recovered from this coarse ash and used as a recycled fuel. Particles finer than 100 mesh flow over the top of the classifier through the white plastic pipes into the next step of the process, flotation. This is where fine carbon is separated from fine ash.

The fine ash slurry that overflows the top of the hydraulic classifier flows into flotation cells. These cells are essentially agitated tanks. Air is added to the flotation cells and air bubbles are produced. Carbon particles stick to the air bubbles and as the bubbles rise, they coalesce into a stable froth on the top of the cells. This is then removed with mechanical scrapers.

After a residence time of 4 to 5 minutes, the ash slurry exits the cells with most of the carbon removed. This material can be dewatered and used as a cement replacement or pozzolan in concrete. The high carbon froth removed by the mechanical scrapers can also be used as a supplemental fuel.

To help the carbon particles stick to the air bubbles, a patented reagent is added. A frother is also added, which produces many small air bubbles to effectively collect the small carbon particles. In the flotation process, two products are made from the ash.

Another product can be recovered with the Fast Float process. The low carbon ash slurry produced by flotation can be further separated in a secondary classifier. Here, the object is to recover only the smallest ash particles, those less than 10 or even 5 microns in diameter.

To do this, the low carbon ash slurry from flotation is pumped into one end of this large blue tank. As the slurry flows from one end of the tank to the other, the coarser particles settle and only the smallest particles remain suspended. Since the settling rate of these particles is extremely slow and the tank is so large, slanted plates are installed parallel to the flow. These plates provide a settling surface for the coarser solids.

As particles accumulate on the inclined plates, they slide to the bottom of the classifier and are removed with pumps. The plates also keep the tank quiescent, which allows the smallest ash particles to remain suspended until they overflow the end of the classifier.

The classifier overflow contains the tiniest ash particles. This slurry is pumped into a large settling tank. Here a flocculant is added to agglomerate the particles to help them settle faster. Clear water flows over the tank and is re-used. The thickened fine particles are dewatered and dried for use in high performance concrete or as plastic additives.

Yet another product is recovered in the secondary classifier. Cenospheres, which are hollow glass spheres, float to the top of the classifier where they can be collected. Cenospheres are used in many products including ceramics and even bowling balls.

Questions should be addressed to one of the individuals listed on this page:

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