

Commercial Demonstration of the Manufactured Aggregate Processing Technology Utilizing Spray Dryer Ash

Participant

Universal Aggregates, LLC

Additional Team Members

P.J. Dick, Inc. — project management and construction

SynAggs, LLC — marketing

Location

King George County, VA
(Birchwood Power Facility)

Technology

Universal Aggregate’s manufacturing process for conversion of spray dryer solid residue into construction-grade aggregate

Plant Capacity/ Production

150,000 tons/year of lightweight aggregate

Coal

Bituminous, 0.9% sulfur

Project Funding

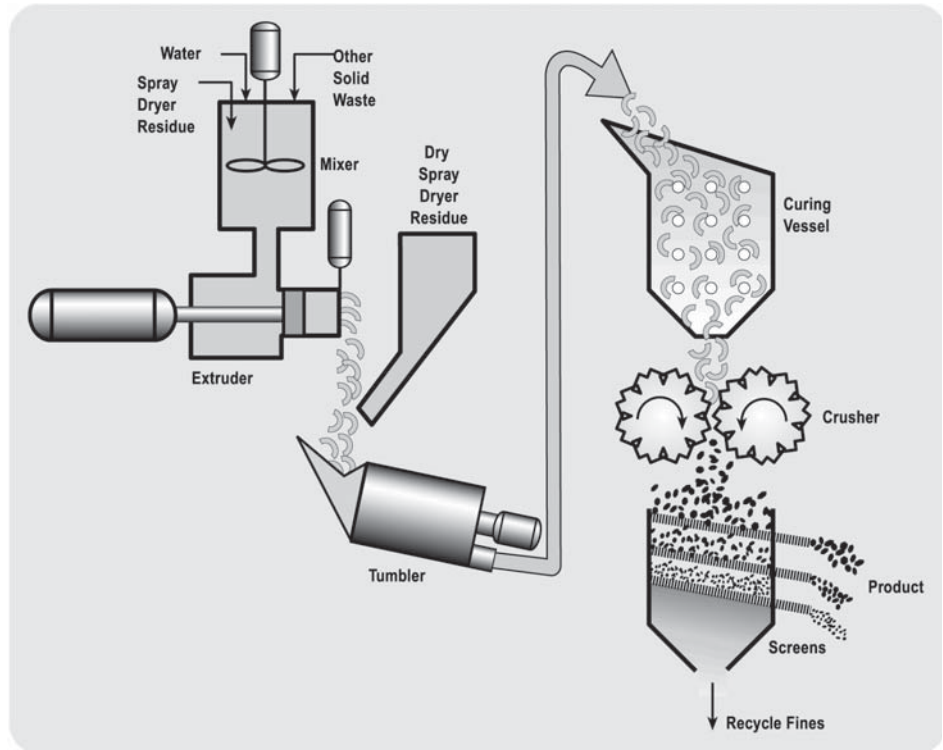
Total	\$19,581,734	100%
DOE	7,224,000	37
Participant	12,357,734	63

PPII

Industrial Applications

Direct Coal Use

By-Product Use



Objectives

To demonstrate conversion of 115,000 tons/year of spray dryer solid residue into 150,000 tons/year of lightweight aggregate meeting or exceeding American Society for Testing and Materials (ASTM) specifications for commercial construction-grade products, such as masonry blocks or lightweight concrete, including compressive strength.

Technology/Project Description

The project demonstrates conversion of spray dryer solid residue and other solid wastes from the 250-MW Birchwood Power Facility into construction-grade lightweight aggregate applicable to masonry block, lightweight concrete, or asphalt paving material. In the process, residue from the spray dryer and other solid wastes from the power plant are blended in a mixer (pug mill) with water to produce a uniform granular material. The loose, moist material then is fed to an extruder that intensifies mixing by shearing the material as it is forced through holes in a metal die to form wet “green” pellets. The green pellets are tumbled with additional dry spray dryer residue, embedding the residue into the pellets. The pellets are dried and hardened in a curing vessel specially designed to allow the solids to flow continuously, avoiding choke points and impediments that could hang up the material. After curing, the hardened pellets are crushed and screened to specification, then stockpiled for sale as manufactured aggregates. Once consistent operation is achieved, the Universal Aggregates manufacturing process at the Birchwood Power Facility will produce 150,000 tons of aggregate a year.

Benefits

As new environmental standards take effect, power companies are expected to install more scrubbers, including spray dryer technology like that applied at the

Project Duration 50 Months	Period of Operation 31 Months	Status/Schedule
		*Estimated date

Birchwood Power Facility. While air quality will improve, scrubber waste tonnage inevitably will increase, placing greater burdens on landfills and increasing waste disposal costs. Of the 28 million tons of scrubber residue produced annually today by coal-fired plants, only about 30 percent is reused and most of that is from wet scrubbers. Providing the means to convert dry scrubber residue to salable by-products is deemed crucial by many in the power industry who believe that, as additional scrubbing is required, dry scrubbers will be the technology of choice. There currently are 21 spray dryer facilities operating in the United States that produce an adequate amount of spray dryer residue to economically justify the installation of a lightweight aggregate manufacturing facility. The construction aggregate market in the United States is estimated to be about 2 billion tons annually.

Status/Accomplishments

On November 14, 2002, a cooperative agreement was awarded. The National Environmental Policy Act (NEPA) requirement was met with an Environmental Assessment (EA) and a Finding of No Significant Impact (FONSI) on October 2, 2002.

Universal Aggregates is working through control of process parameters, refinements to chemical compositions, and equipment modifications in an effort to achieve steady-state operation. Retention times and water sprays in the pug mill had to be adjusted. Variations in calcium hydroxide levels in spray dryer residue have required installation of a secondary lime slaker. Universal Aggregates is performing various parametric tests to determine a suitable admixture capable of stiffening the extruded material. The tests include various combinations of sand, bottom ash, and recycled embedding material.

While improvements have been realized with the extruder, problems continue with components of the curing vessel, dust collection, and the ash transfer system. The plant has not been able to consistently operate in a fully integrated mode. Modifications to improve operation continue. Some of the modifications to improve operation include: changes to the curing vessel rotary feed and delivery chute arrangement; fabrication and installation of a dust collection system at the base of the curing vessel; changes to the ash feed system; installation of a recirculating system for the curing vessel; and a new centralized baghouse that replaced two smaller units.

Contacts	
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S T A T U S	R e p o r t	<i>Final Report Issued</i>	<i>6/07*</i>
		<i>Draft Report Issued</i>	<i>3/07*</i>
		<i>Operation Completed</i>	<i>12/06*</i>
	O p e r a t i o n		
		<i>Operation</i>	<i>6/04</i>
	C o n s t r u c t i o n		
		<i>Construction</i>	<i>3/03</i>
	D e s i g n		
		<i>Award</i>	<i>11/02</i>
	P r e A w a r d	<i>NEPA Completed (EA and FONSI)</i>	<i>10/02</i>
	<i>Selection</i>	<i>9/01</i>	