

# **“Commercial Demonstration of the Manufactured Aggregate Processing Technology Utilizing Spray Dryer Ash”**

## **Quarterly Technical Progress Report**

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## Abstract

This quarterly report covers the period from October 1<sup>st</sup>, 2004 through December 31<sup>st</sup>, 2004. It covers: technical development, permitting status, engineering status, construction status, operations summary and marketing support activities for this period.

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## Executive Summary

Plant startup is still continuing. Testing of admixtures to enhance extrusion and SDA wetting is continuing. Green extrudates and embedding material were loaded into the curing vessel on October 14<sup>th</sup>. The whole plant was integrated on December 16<sup>th</sup>. Efforts are underway to improve plant availability.

I) Experimental – This section is not applicable to this project.

II) Results and Discussions

This section is broken down into the following subsections: Technical Support, Permitting, Engineering, Construction, Marketing Support, Operations Summary and DOE activities. These subsections describe the activities that have taken place during this quarter as they pertain to this project.

**A) Technical Support**

Extrusion runs were conducted continuously with adequate water and admixture addition in pugmill. Extruded products with good structural integrity and few fractured pieces were produced with the 1.25” and 2” diameter die installation. Moisture content and temperature of extruded products were monitored to correlate with operation conditions for quality and process control. Extruded products made from both die installation were collected and charged separately to a heated 55-gallon drum for curing. Curing conditions were simulated to those in curing vessel for aggregate production. Both extruded products developed high crush strength after curing. The cured products were crushed and screened to proper size gradation for use in production of concrete masonry units (CMU) at the National Concrete Masonry Association (NCMA) for evaluation.

Hydrated lime content in spray dryer ash (SDA) and calcium utilization in spray dryer for sulfur removal were determined to monitor the progress of the spray dryer modification program for lime optimization at the Birchwood Power Plant (BPP). Hydrated lime content in SDA decreased from high 20% in July to September to low 20% and below in October to December. Calcium utilization increased from high 10% to low 20% in the same period. Both indicated the success in implementation of the program at BPP. Decrease in hydrated lime content in SDA can reduce the stickiness of wetted ash and improve extrusion operation.

Mix designs were recommended for curing vessel feeds and integration runs with recycles from curing vessel. A program was implemented to monitor qualities of recycles and aggregate products. Qualities of recycles include moisture content, hydrated lime content and size gradation, which are related to curing operation. Qualities of aggregate products include bulk density, size gradation and fineness modulus. Changes in qualities of recycles and aggregate products were monitored during the integration runs in December. Test results will be used as a reference to monitor performance of future integration runs.

**B) Permitting**

No activity this quarter.

**C) Engineering**

A new extruder liner was tested at J. C. Steele. Modifications are pending. A new pugsealer auger was designed and fabricated and will also be tested at J. C. Steele.

Modifications to the PLC program continue. Three new conveyors for handling processed SDA were designed and procured. New dust collectors were specified and purchased. Plans are underway for the May 2005 outage.

**D) Construction**

A new dust collector was installed for SDA feeders K-120A & B. Modifications to the inlet cones in the curing vessel were completed. A new diversion valve was installed on the recycle line.

**E) Marketing Support**

Conduct regular, weekly meetings (on site) with contract aggregate distributor/buyer regarding status of plant start – up, quality control, trucking and truck - scale ticketing, future product inventory and distribution, product/customer tracking, and invoicing.

As part of Universal Aggregates' contingency plan through plant start – up; two, municipal solid waste landfills continue to beneficially utilize the fixated SDA, as “Alternate Daily Cover”, on a regular basis.

Continue inquiry for additional beneficial use potential in soil stabilization applications; SDA samples provided for testing with two contractors, and some testing conducted by Universal Aggregates lab to demonstrate the effectiveness of the SDA to improve soil, engineering properties.

Lightweight aggregates produced through the “commercial” extrusion process, were cured in laboratory – scale, curing vessels to examine strength development and compliance for “specification” quality. The cured extrudates were crushed and screened to meet the applicable gradation requirements for use in concrete masonry. Using the mix design of a local masonry producer (future buyer), this lightweight aggregate product was then utilized to produce concrete masonry units at the National Concrete Masonry Association (NCMA) in Herndon, Virginia, meeting and exceeding the applicable ASTM quality requirements for compressive strength, absorption, unit weight, and density.

In December, full integration of Universal Aggregates' commercial facility enabled the distribution of 430.5 tons of lightweight aggregate to a future product consumer. The consumer/user (a Maryland masonry producer) successfully manufactured concrete masonry using Universal Aggregates' commercially produced, lightweight aggregate product.

Continue to assist with plant start – up, process and product testing, admixture evaluation, contingency plans, product transportation, and promotion to potential consumers/users.

## **F) Operations Summary**

We continue to staff and operate 24 hours a day. We continue to have a weekly safety meeting and we are still looking for additional manpower to staff the plant, specifically: mechanic, electrician, and operating technicians.

The Birchwood station underwent their Fall outage lasting approximately 7 days. During that period UA performed maintenance on: F-120 relief valve, dust collectors, ash transport system, Scott mixer, extruder, pugsealer and pugmill. We switched to a 1.25" diameter extrusion dye. We were able to successfully send material to the tumbler and up into the curing vessel on Oct 14<sup>th</sup>. This lasted for approximately 7 hours, before we plugged the inlet to the vessel. We modified the inlet cone and cleaned up the spillage. We were able to try the modified inlet one more time for approximately 3 hours, before plugging the plant dust collector and forcing the unit off line. The power station continues to work on reducing their lime consumption and producing a lower lime content ash. Recent values are trending in the low to mid 20s. We are still testing the W. R. Grace and Master Builders admixtures as extrusion aids. Both of these items have allowed the plant to start and produce extrudates on demand.

During the month of November we conducted tests on a 1" die as well as a single wing point auger. We were unable to run the 1" die with any degree of success with its current configuration, nor were we able to run the single wing point auger as received. The single wing point auger that we tried has no gap for pins and it appears, based on our evaluation of that auger, that we do need to have pins to prevent barrel rolling. The double wing point auger was reinstalled with the gap for the pins. During the month of November we did see a higher carbon level in the ash because of classifier tuning and mill maintenance on the Birchwood Power Plant Facility. During the week of November 15<sup>th</sup> we did perform an extended extrusion run. We were at 40% capacity and overall for the 4 days we were approximately 70% available. On the 17<sup>th</sup> we were approximately 90% available. We attempted to go to the curing vessel all four days but because of nuisance problems we were unable to do so. We had a meeting with J. C. Steele personnel at the Birchwood Plant, looking at modifications and improvements to the pugmill, pugsealer, and extruder.

During the month of December we continued to work towards integration of the plant finally achieving integration on December 16. Integration means; the utilization of the recycle material back into the mix, in other words, we are making extrudates, putting them in the tumbler with embedding material, sending them to the curing vessel, drawing material out of the bottom of the curing vessel, screening the embedding material off, sending that to the recycle silo, recycle feeder into the pugmill for mixing into the extruder. The balance of material is crushed and screened then to stockpile. Integration was achieved at approximately 30% capacity. We also began shipping crushed stone around the middle of the month. This crushed stone is a mixture of manufactured lightweight aggregate as well as the Solite startup aggregate that was initially loaded into the curing vessel. We were able to extrude up until we reached a high carbon ash near the end of the month. By testing different ad

mixtures we were able to find one that allowed us to extrude reliably. We are also working to resolve an issue with the ash transport system that we've recently experienced during the severe cold spell. We are limited in ash transport to about 12,000 pounds an hour, which is about 25% capacity. The steam system was energized to preheat process water on December 28<sup>th</sup>.

Universal Aggregates continues with complete ash processing and disposal responsibilities.

**G) DOE**

The Quarterly Progress Report was submitted for the fourth quarter of 2004.

- III) Conclusion – The schedule has been revised for phase III. The activities described in section II will continue into the next quarter.
- IV) References – Not applicable for this report.