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

Quarterly Technical Progress Report

October 1, 2005 through December 31, 2005

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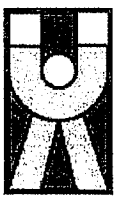
DOE Cooperative Agreement DE-FC26-02NT41421



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DISCLAIMER

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ABSTRACT

This is the quarterly report under the subject agreement for the period from October 1, 2005 through December 31, 2005. The report summarizes activities for the project for the period in the following categories: personnel, operations, engineering, technical support, and marketing support.

Executive Summary

During this quarter, the milestone of 24 hours continuous operation was achieved for the project (on December 12-13). Plant startup continues. Numerous equipment and operational problems continue to limit production and impede plant availability. The management team for the project was replaced this period and has focused on identifying and evaluating the widespread problem areas of the plant.

EXPERIMENTAL

This section is not applicable to this project.

RESULTS AND DISCUSSION

Personnel

In October, the management team for the project was overhauled. Gary Cairns has taken over the role of lead engineer and Jim DeSilvey was hired as the new plant manager for the project. In addition, six new technicians were hired this quarter to staff the plant (five mechanical and one operating technician).

Operations Summary

During the month of October, the front end of the plant (pugmill/extruder) had been performing well. SDA had been processed through the plant at throughputs between 24,000 and 29,000 pph. Some downtime was required to implement some modifications, e.g. adjusted pitch on pugmill knives in effort to improve retention, installed new water spray nozzles. In addition, part of a shift was lost resolving lubrication issues with the pugsealer bearing. The new nozzles improved the wetting of the material, but additional refinement is required. Several items prevented sending material to the CV including: servicing seized rotary valves, clearing sludge from scrubber tank, cleaning scrubber blower, and failed circuit boards on the variable frequency drive (VFD) for the crusher. When all of the above were completed, a ten-hour continuous run to the CV was completed on 10/15.

Later in October, the plant was down on numerous occasions due to necessary repairs/maintenance, including: a failed extruder blower motor, a broken control wire on the stacker conveyor, replacing a damaged belt on the stacker conveyor, a thorough cleaning of the pug mill/sealer/extruder, and a broken shear pin on the extruder feed auger. Modifications (by outside contractors) to the CV pant legs and the rotary chute prevented sending material to the CV for three days. Subsequent adjustments to the rotary chute were required to prevent mechanical binding/failures. Intermittent runs to the CV were executed initially at 29,000 pph SDA with 4,000 to 6,000 pph recycle added to the mix (rather than exchanged). Some runs were completed (2 to 6 hour duration) at 25,000 pph SDA plus 8,000 pph recycle. At these higher throughputs, the quality of the extrudates deteriorated somewhat, but the penetrometer readings sustained acceptable levels. These results tend to validate our discussions with J.C. Steele (reference Engineering section) to slow down the speed of the pugsealer.

Operations to the CV were halted by other items including: replacing a broken belt on the 410D conveyor (bottom of CV), replacing drive belts on the lime pulverizer motor (which occurred shortly after replacing the screen in the pulverizer), and intermittent mechanical failures of the rotary chute. Large chunks at the discharge of the CV (cause of 410D belt failure) have been occurring more frequently and must be addressed.

In November, the front end of the plant (pugmill/extruder) continued to operate at an improved level of reliability. SDA was processed through the plant consistently at 29,000 pph and recycle material had been introduced at feed rates as high as 12,000 pph. At these higher throughputs, the quality of the extrudates again deteriorated, but the penetrometer readings consistently sustained at acceptable levels
Over Thanksgiving weekend, the plant was in operation with product being sent to the curing vessel ~12 to 14 hours in total. Problems that halted operations to the CV included: a weather-related power outage, an apparent error in the PLC logic that controls the rotary chute, and a loss in ash feed from Birchwood's ash silo.

During the month of December, ~4,260 tons of dry SDA were processed through the plant and approximately 800 tons of cured aggregate were produced. Operations to the curing vessel continued on intermittent intervals lasting between 4 and 12 hours. On one occasion, operations to the CV extended for ~34 hours within a 36 hour period. Temporary electrical modifications were implemented so that the pugsealer could be operated and evaluated at reduced speeds on a trial basis. This evaluation was cut short as the sealing core auger of the pugsealer failed during the trial period. The sealing core auger was replaced with a prototype auger that was designed by J.C. Steele and fabricated many months ago. The prototype design incorporates a 1.3:1 compression ratio versus a 2.5:1 compression ratio of the original auger. Evaluation of the prototype auger continued into January. At months end, an oversight in the control logic caused a large overrun/spillage at the top of the CV. This overrun in turn forced the main conveyor belt off track, which prevented any further runs to the CV.

Engineering

The new management team continued its effort to identify and evaluate problem areas throughout the plant, including: the ash transfer system beneath the Birchwood ash silo, control of ash level and excess air in the SDA day bin, dust control at the bottom of the CV and throughout the main plant, the wet scrubber and dust control at the top of the CV, and refinements to the PLC control logic. Discussions with relevant vendors and engineering firms regarding these problem areas are ongoing. A conference call was held with Chick Whitaker (J.C.Steele) on 10/16. The call included a discussion about increasing vacuum at the pugsealer. Chick emphasized that the sealer must not be starved for material and suggested we consider slowing down the pugsealer shaft by means of a jackshaft. A dust collection consultant from Airotech Environmental was contracted and on site to tour the plant and offer his recommendations. Dialogue was initiated in October and continues with Imperial Technologies (IT) regarding options/modifications to the CV discharge and recycle loop of the CV. IT is responsible for original design/engineering of the CV discharge and the supplier of the two multifold conveyor belts. Some follow-up discussions have taken place with both Airotech and Chick Whitaker (J.C.Steele). Chick provided a price quotation for Variable Frequency Drives. Alternative means to slow the speed of the pugsealer are under evaluation. Ed Bucka of TPI Engineered Systems (supplier of existing screw conveyors) was onsite to offer recommendations on possible modifications. Ken Deibaugh of Lewis-Goetz and

Company was onsite (10/31) to make recommendations on various items including: belt tensioning hardware, polymer slide bars in place of pulleys (L-410F belt, base of CV), and rubber for skirting. In late December, design for the CV recirculation feed system onto L-410A conveyor belt was finalized with IT. An order was placed with Airotech Environmental for a 6,000 ACFM dust collector to address the dust emissions at the bottom of the CV. A circulation pump and necessary plumbing were specified and installed so that lignosulfonate can be purchased and stored in the existing bulk additive tank rather than totes.

Technical Support

Tests were conducted to evaluate the effect of pugsealer speed on pugsealer and extruder operations and on properties of green extrudants. Test results showed that the extruder vacuum could be increased with reduction of pugsealer speed to improve structural integrity of green extrudants for aggregate production. It is advantageous to have a drive to control speed for pugsealer operation. Lump materials collected from bottom of curing vessel had high moisture contents. The high moisture content indicated that lump formation in curing vessel was caused by steam condensation in curing vessel. Ventilation ductwork of curing vessel was being modified to reduce or eliminate steam condensation for lump formation.

Hydrated lime and carbon contents in spray dryer ash (SDA) were monitored for ash quality in this quarter. The average of hydrated lime contents increased from October (11.5±2.4%), to November (13.9±2.4%) and to December (18.6±1.1%). The increase in hydrated lime content is related to the change in spray dryer operation at BPP. The carbon contents in SDA were mostly in the range of 3.9 to 5.0 %. Both are adequate for aggregate production.

Miscellaneous

A waste oil-fired unit for space heating the high bay area of the plant was installed. A large gear reducer was installed to directly drive the rotary chute at the top of the CV in an effort to overcome any mechanical binding. Additional flighting for the L-310 screw conveyor was installed so that SDA is delivered to the pugmill in a more uniform fashion. Replacement electronics were installed on the radar level instrument for the SDA day bin. A belt scale was installed on the stacker belt to meter tonnage of produced aggregate product. An elbow on the SDA transport piping was removed, inspected (~50% blockage), and replaced.

Marketing Support

Conduct regular, weekly meetings (on site) with contract aggregate distributor/buyer regarding status of plant start-up and quality control. Continue to assist with plant start-up, process and product testing, admixture evaluation, contingency plans, product transportation, and promotion to potential consumers/users.

DOE

The Quarterly Technical Progress Report was submitted for the third quarter of 2005.

CONCLUSION

During this quarter, the milestone of 24 hours continuous operation was achieved for the project. A new management team for the project was invoked. Extensive problem areas exist throughout the plant. Specific problem areas have been identified.

REFERENCES

Not applicable for this report.