Title: Pilot-Scale Testing of a Vibrating Electrostatic Separator for Fly Ash Decarbonization

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Author(s): Roe-Hoan Yoon[1], Eric Yan[1], Oh-Hyung Han[2] and [3]Byung-Wook Park

[1]Minerals and Coal Technologies, Inc.
2909 Wakefield Drive
Blacksburg, Virginia
24060

[2]Chosun University
375 Seosuk-Dong,
Dong-KU, Kwang Ju
501-759, Korea

[3]Korea Flyash Cement Company, Ltd.
287 Eunpo-Myun,
Boryung, Chungnam,
Korea

Summary

A new electrostatic separator has been developed for the separation of unburned carbon from fly ash. In this separator, a flowing film of fly ash is created on the surface of a vibrating electrode. Conducting particles such as unburned carbon acquire the charges of the same sign as that of the electrode and jump out of the flowing film, while non-conducting ash particles move forward. Based on the bench-scale test work, a pilot-scale test unit has been constructed and tested successfully at 0.5 tonnes/hr capacity. In the present communication, the results obtained in the bench- and pilot-scale test work will be presented. At present, the new separator is being scaled-up to 3-5 tonnes per hour capacity at the Korea Fly Ash Cement Company.

The bench-scale test work conducted using a 9.8 x 35.4-inch unit on a several different fly ash samples. Initial tests were conducted using a +400 mesh fly sample from Korea Fly Ash Company, assaying 26% LOI. After 3 passes, the LOI was reduced to 3.2% with 68% recovery. After four passes, the LOI was reduced to 1.6% with 65.9% recovery. With a +200 mesh, the LOI was reduced from 24.7% to 2.3% with a 69.0% recovery. In another test, the same +200 mesh fly ash was cleaned to 1.3% LOI with 65.9% recovery. This result was obtained after 5 passes at 30 kV of applied potential.

With a unsized feed sample, which assayed 8.63% LOI, was cleaned to 4.8% LOI with 95.9% recovery after a single pass. After several stages of cleaning, the LOI was further reduced to 2.8% with a 86.3% recovery. With a -200 mesh fly ash sample, the LOI was reduced from 4.3% LOI to 3.0% LOI with 89.1% recovery after a single pass.

Based on the bench-scale test work, a pilot-scale test unit was designed and constructed. The results obtained at approximately 0.5 to 1 ton per hour capacity were comparable to those obtained with the bench-scale units. At present, a larger scale unit is being built at the Korea Fly Ash Company. It is planned that this unit will be used to recover fly ash from the reject streams generated from a GE separator.