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MASTER

HEAVY-LIQUID BENEFICIATION OF FINE COAL

Second Quarterly Report
Supplement

For The Period

January 1, 1981 - March 31, 1981

Douglas V. Keller, Jr.

Frederick J. Simmons

OTISCA INDUSTRIES, LTD.

Prepared For The:

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Work Performed Under Contract

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I. Introduction

In our second quarterly report we experienced some unusual phenomena that were counter to the rheological trends of solid slurries experienced in the past. Upon further analysis it appeared that a slip phenomenon was occurring between the rotor being used in the measurement system and the coal-liquid slurries. In order to correct for the slip experienced, a profiled sensor was employed for a second series of measurements. The results of the first series of these measurements are presented in this supplement.

II. Discussion

The profiled sensor used for this second series of measurements was identical to the smooth sensor previously used with respect to length and diameter. The difference between the sensors is the presence of vertical grooves approximately 1 mm wide by 1 mm deep evenly spaced around the rotor and running the full length of the rotor. Identical grooves were inside the walls of the cylinder. These grooves presented a surface that was more sensitive to the effects of the particles with respect to the overall slurry viscosity.

The second phenomenon we observed was the apparent migration of the particles away from the rotor as shear rate

increased. This phenomenon can only be corrected by staying at a sufficiently low shear rate. For this set of tests we wanted to evaluate the viscosity with respect to the previously experienced slip phenomenon. To reduce the effect of migration a shear rate of 80 sec.^{-1} was chosen.

The data obtained from a reevaluation of the solids volume percent, specific gravity and size distribution are presented graphically in figures 1 and 2.

It is very evident when comparisons are made with the data presented in our second quarterly report that the profiled sensor system is more sensitive to the contribution of the solids to the overall slurry viscosity. Further tests of the profiled sensor using Newtonian viscosity standards produced the same results as obtained with the smooth sensor.

III. Summary

The profiled sensor reduced the slip effect previously observed. We are now able to conduct measurements which are representative of the true behavior of the liquid-solid slurries under investigation.

Figure 1

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Figure 2

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