FINE COAL DEWATERING

by

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Thesis submitted to the Faculty of the
Virginia Polythechnic Institute and State University
in partial fulfillment of the requirements for the degree of

Master of Science

in

Mining and Minerals Engineering

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December 5, 1997
Blacksburg, Virginia

Keywords: coal, vacuum filtration, centrifugation

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(ABSTRACT)

Fine coal constitutes a relatively small portion of a product stream in a coal cleaning plant. However, its processing cost is approximately three times higher than the cost of processing coarse coal. Therefore, many coal companies chose to discard the fines to refuse ponds, causing a loss of profit and creating environmental concerns. This problem can be solved by developing more efficient fine coal dewatering processes, since bulk of the cost associated with processing fine coal is due to dewatering. For this reason, Virginia Tech has developed new chemicals that can increase the efficiency of mechanically dewatering coal fines.

To determine the performance of the novel reagents on fine coal dewatering, laboratory vacuum filtration and centrifugation tests were conducted. The utilization of the novel dewatering aids in the dewatering systems decreased the final moisture contents of the filter cakes to sufficiently low values. There was approximately 50% reduction in the cake moisture of many coal samples with the usage of the novel dewatering aids. The tests were performed on various coal samples from different coal preparation plants. This gave the advantage of testing the novel dewatering aids at many different conditions since each sample had its own characteristics.

The vacuum filtration tests were extensively used to compare the efficiency of each novel reagent in dewatering. The best performing dewatering aids were determined and they were further utilized to analyze the effects of operational variables, such as; drying cycle time, cake thickness, vacuum pressure level and slurry temperature on dewatering. A statistical analysis was also performed to observe the effect of each factor quantitatively. The analyses were very useful in terms of determining the synergistic effects of these factors in dewatering of fine coal.

The centrifuge tests were conducted to examine the efficiency of the novel reagents in a different dewatering application. The experimental results showed a significant improvement in centrifuge dewatering with the usage of proper coal sample. The moisture contents of fairly thick cakes decreased down to 5-10%. This outcome was very satisfactory since most of the

dewatering aids commonly used in the coal industry were observed to increase the final cake moisture in centrifuge dewatering instead of decreasing it.

Finally, surface chemistry analyses were performed on the coal samples and slurries to analyze the changes in the chemistry of the dewatering system in the presence of the novel dewatering aids. It was observed that there was a favorable improvement in the system chemistry, which was helpful in terms of decreasing the cake moisture content. These observations were also consistent with the results of the dewatering tests. The combined effect of the novel additives in decreasing the surface tension of the slurry and increasing the contact angle of the coal surface at the same time was concluded to be the reason for their significant performance as dewatering aids.

ACKNOWLEDGMENTS

The author would like to extend her gratitude and appreciation to Dr. Roe-Hoan Yoon for his guidance and support throughout the course of this study. She also would like to thank Dr. Cesar Basilio for teaching her the fundamentals of the dewatering project and sharing his knowledge during her research studies and Dr. Gregory T. Adel and Dr. Gerald H. Luttrell for their advice during the progression of this project.

The author would like to thank to Bird Machine Company for their assistance to perform the centrifuge tests. Special thanks to her colleagues Subramanian Vivek, Neeraj Mendiratta, Rajesh Pazhianur, Zhuo Chen and Eric Yan for their friendship, assistance and valuable discussions.

Finally, the author would like to convey her deepest thanks to her parents and her husband for their invaluable support, patience, encouragement and special love that made this study possible.

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