A novel approach to reagent selection for coal flotation

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†Abstract written on project work carried out in partial fulfilment of B.Eng (Metal.)

Synopsis

Considerable amounts of fine particles (smaller than 150 micron) are produced during the processing of coal. Significant value can be realized if this fraction can be economically beneficiated, disregarding the negative environmental impact of fine coal. Flotation is a very common worldwide beneficiation process to recover ultra-fine coal material and has been implemented in many oversees operations. However, flotation in South Africa has not fully matured—difficult coal types, high operating cost, inexperience of plant personnel and cell design are only a few of the reasons for flotation not being widely implemented. Reagent cost is by far the largest single contributor to the operating cost. The challenge with reagent selection, however, is that reagents are very selective and very sensitive to a change in ore characteristics—a new reagent combination is required when there is a drastic change in the ore characteristics. Frother selection is crucial due to the fact that the coal has a froth carrying capacity constraint. However, frother test work is notoriously difficult on a laboratory scale. Therefore, the aim was to develop a fast, effective and reliable method of choosing flotation reagent combinations and to verify this combination on a pilot scale. Laboratory scale froth characterization techniques (froth height, froth breakdown rate, froth carrying capacity, froth water recovery, selectivity and solids concentration in froth) were conducted in a 3 litre Leeds cell and Bikerman flotation column, whereas the pilot-plant scale tests were conducted at Kangra coal in a Dual Cell from ENPROTEC. The results have indicated that the froth characterization tests can be very successfully implemented to select a reagent combination that realizes significant value during pilot campaign runs. The pilot-plant results showed that by changing the reagent regime to the lab-predicted suite, a reagent cost saving of 43%, an increase in yield of 5%, with a decrease in product ash of 3%, can be realized.

†Investigative work is continuing and a full paper will be presented on completion of the project.

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 SA ISSN 0038–223X/3.00 + 0.00. Paper received Feb. 2010; revised paper received Feb. 2010.