

### METHODS OF MAGNETITE RECOVERY

The objects of the magnetite recovery circuit are to:-

1. recover the magnetite in the wash water,
2. separate the slurry from the magnetite,
3. concentrate the magnetite for re-use in the circuit.

Of the methods which have been used the most common is magnetic separation.

Today belt separators are being replaced by drum separators using permanent magnets of Alcomax III. These give a reliable strong field unaffected by stray fields from adjacent cables or by elevated temperatures. Ceramic type magnets (barium ferrite) show little tangible advantage. Field strengths required are of the order of 300-650 gauss, measured two inches from the drum surface.

Capacity of drum separators is given as 2 - 4 tons per foot width per hour for a thirty inch diameter drum with a recovery of 99.8%. Recovery efficiency is reduced by reduction of magnetite content per unit volume of slurry treated so that it is advantageous to thicken first. The grade of the concentrated magnetite is influenced by the quality of the feed. For example an eighty per cent. grade may be made from a feed containing sixty per cent. magnetics or a ninety per cent. grade from a feed of seventy per cent. magnetics. The density of the discharged product is of the order of 2.2 to 2.4 gms. per c.c.

Research on the use of froth flotation has shown this process to be useful as an aid in magnetite recovery. (It is important to note that sharpness of separation is decreased by the loss of fine magnetite, which affects both stability and viscosity)

Flotation may be used at one of two points in the circuit. If much fine coal is influencing magnetic separation efficiency, especially in cyclones, it should be removed prior to magnetic treatment.

Alternatively the effluent from magnetic separation after the addition of M.I.B.C. may be floated to recover clean coal. The residue after treatment with oleic acid is then floated to recover the magnetite which is re-circulated for further use. In a typical case, recoveries and grades were as follows: (U.S.B.M. - R.I. 6821)