

ferrous, ferric, manganese, nickel, magnesium and calcium sulphates, chlorides and dissolved silica. The treatment was largely conducted underground, the precipitated contaminants being left in underground sumps. The objects of the treatment were to limit erosion and corrosion of the mine drainage equipment and to supply water for process and dust suppression purposes. The scale of the operations may be judged by the reported use of over 15,000 tons of lime by the Rand group of mines in the year 1951.

The use of lime in the purification of acid mine drainages from lignite mines in Eastern Germany was described by Rummel, 1959 (37), Kadner, 1961 (38) and revealed that some 80,000,000 Imp. gal of acid mine drainage were being treated each day in the Niederlausitz. The successful application of lime to the treatment of acid drainage from an abandoned coal mine which had been intercepted by strip workings was reported by Brant, 1960 (39). The neutralized drainage was passed through ponds which successfully removed the precipitated metal salts.

During the last few years, a detailed investigation of the lime process for acid mine drainage treatment has been made during the project known as "Operation Yellowboy" which was sponsored by the Commonwealth of Pennsylvania. The objectives of this work were described by Maneval, 1965 (40) and results of the tests have been reported by Girard, 1966 (41), and Charnbury, 1967 (42). The applicability of lime treatment to at least one acid mine drainage has been confirmed, and the costs of treatment in this one case were \$1.09/1,000 U.S. gal, equivalent to a cost of 5.2 cents/short ton on the coal produced.

Lime or hydrated lime neutralization processes have several major drawbacks. These include cost of reagent and the production of a voluminous sludge which is difficult to separate and handle subsequently. For these reasons, research has been conducted by many workers to evaluate the use of limestone as a neutralizing agent.