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Magnetic-Concentration-Technology

Magnetic separation, which is a engineering practice of long standing, is used for the concentration of magnetic materials. In the past, magnetic separation equipment, designed with magnetic materials, played and important role in the production of iron. The separation is accomplished by passing mixtures through a magnetic field, which leads to a preferential retention or deflection of the material which is to be separated. The same objective is often achieved in a variety of ways. In magnetic separation the main factor depends on the motion of the materials in response to the magnetic force, and competing forces, namely gravitational, hydrodynamic, inertial and centrifugal forces, that all contribute to the overall scenario of magnetic separation. The Chinese harnessed the directional properties of magnets as early as the first century B.C.. Magnets embrace the oldest magnetic material known to man, i.e. magnetite or lodestone, as well as commercially significant fine-particle magnets. Magnetic material is capable of storing a certain amount of energy. The early history of magnetic separation is closely connected to using these magnets to recover strongly magnetic materials (mostly iron). Magnetite is the most fundamental and important magnetic oxide in rocks. Its magnetic properties have long been studied and contributions to magnetism have been classified on the basis of ferromagnetism. Magnetite is therefore an inverse spinel, whose ferromagnetism fundamentally results from interaction between two sublattices. Ball, Norten, Edison and others applied this principle and process even further to the separation of iron ore utilizing electromagnetic drum separators. Faraday discovered that all matter responds to the presence of the external magnetic fields, and this has brought the extension of magnetic methods of separation to materials whose magnetic susceptibilities is classified as nonmagnetic, diamagnetic or paramagnetic. The ferromagnetic slurry fed into the magnetic separator will thus be split into two or more components. The performance of the magnetic separator can be seen by the recovery of magnetic material in the mags relative to that of the feed,. where a wide gap exists between the magnetic properties of the materials. The useful product may be either the magnetic or nonmagnetic fractions. Various types of rotating drums have been employed for a wide variety of applications. Where the drums rotate around stationary magnetic elements. Magnetic susceptibility of mixtures can be affected by the application of ultrasound, which causes a reduction of magnetic susceptibility. Thus Ultrasound can be used to change the magnetic properties of a material with the aim to improve the efficiency of magnetic separation.

Throughout most of the nineteenth century Putnam County, New York was mined of its magnetite deposits. These deposits occurred in the three belts and two remote locations. Magnetite was extracted at fourteen primary mines and numerous minor locations using a variety of techniques. Ore mined was transported by wagon, railroad and ships to both local iron furnaces in Westchester and Putham Counties and more distant markets in New York, New Jersey, and Pennsylvania. With the westward migration of the iron industry in the 1880's toward the lake area, most of the Putnam County Mines ceased to work. Those that remained open invested in extensive open- pits and magnetic concentration technology, however, by 1900 all mines had been closed.

1.) Magnetic Methods for the Treatment of Minerals, J. Svoboda, page 1, 1987)
2.) Industrial Application of Magnetic Separation Y.A. Liu, page 8, 1979)
3.) Magnetite, Mining, And Magnetic Separation, The Industrial Archeology Of 19th Century Iron Mines In Putham County N.Y. Musser, James.E. Rutgers University, New Brunswick, N.J. Geology Dept.)