

TR4-151-153
R.341

MAGNETITE — 10TH LEGION MINE

BENEFICIATION BY MAGNETIC SEPARATION

Sample

A sample of previously split diamond drill core from 10th Legion Mine was received from the Director of Mines per Mr. T. D. Hughes. Beneficiation tests were requested with the object of producing high grade iron concentrates.

The sample as received contained 36.9% of iron, 0.14% of sulphur and 11.8% of acid insoluble material.

The sample was crushed by jaw crasher and further reduced by stage roll crushing to pass 5 mesh B.S.S. After jaw and roll crushing the sample weighed approximately 18 lbs.

No responsibility is accepted for the results shown in this report except in so far as they apply to the sample tested.

Sizing Analysis

| Fraction B.S. | Per cent weight |
|---------------|-----------------|
| — 5 + 10 | 45.6 |
| —10 + 30 | 30.1 |
| —30 | 24.3 |

Investigation

Beneficiation by magnetic separation was investigated at two sizes, minus 5 mesh and minus 30 mesh. From these investigations an indication of what further beneficiation would result from treatment at finer sizings can be obtained and is referred to later.

Minus 30 mesh feed was obtained by stage wet ball mill grinding of minus 5 mesh ore.

Separation of the coarser sizes, plus 30 mesh and coarser, was performed wet with a permanent hand magnet, with cleaning and recleaning of magnetic concentrates and scavenging of tailings while the minus 30 mesh fractions were treated in a Dings Crockett wet magnetic separator, with similar cleaning and recleaning of magnetic concentrates and scavenging of tailings.

Feeding of the finer sizings to the wet magnetic separator was maintained at a low rate and in view of this fact, plus cleaning and recleaning of magnetic concentrates, the results shown in this report may be regarded as of optimum beneficiation.

Summary

1. Mineragraphic investigations show that the magnetite is intimately associated with silicate gangue minerals even in minus 200 mesh fractions. Sulphur content is low, and little beneficiation can be expected.

2. Fine grading is necessary for optimum beneficiation, and test results show that whereas a grade of 47.7% iron is obtained by magnetic separation of minus 5 mesh ore the grade is increased to 64.6% iron in the minus 200 mesh sizing. Treatment of minus 30 mesh ore resulted in a concentrate containing 54% of iron.

3. Recoveries were of the order of 95%.

Test Results*Separation at minus 5 mesh.*

For purposes of separation the minus 5 mesh rolls product was screened into three sizings. Minus 5 mesh plus 10 mesh, minus 10 mesh plus 30 mesh, and minus 30 mesh. Each size was separated individually, and afterwards related products were combined to form composite minus 5 mesh magnetic concentrate and non-magnetic tailings.

The magnetic concentrate amounted to 73.7% by weight of the total feed and contained 47.7% of iron. Sulphur content was reduced to 0.1%, and acid insoluble material to 7.9%. This represents a recovery of 94.0% of the iron.

Separation at minus 30 mesh

The minus 30 mesh ball mill product was screened into three sizings, minus 30 mesh plus 100 mesh, minus 100 mesh plus 200 mesh and minus 200 mesh, and magnetic separation performed on each size individually. In this case concentrates were retained and assayed individually to provide indications as to what beneficiation could be obtained at finer sizings than 30 mesh.

The composite magnetic concentrate amounted to 65.4% by weight of total feed and contained 54.0% of iron. Sulphur content was 0.12%, and acid insoluble material 6.0%. Iron recovery amounted to 95.2%.

Beneficiation at minus 5 Mesh B.S.S.

| Product | Weight | Fe | Fe Dist. | S | Acid Insol. |
|------------------------|--------|------|----------|------|-------------|
| | % | % | % | % | % |
| Magnetic Conc. | 73.7 | 47.7 | 94.0 | 0.10 | 7.9 |
| Non-Magnetic | 26.3 | 8.5 | 6.0 | 0.25 | 22.1 |
| No Beneficiation | 100.0 | 36.9 | 100.0 | 0.14 | 11.6 |

Beneficiation at minus 30 Mesh B.S.S.

| Product | Weight | Fe | Fe Dist. | S | Acid Insol. |
|------------------------------------|--------|------|----------|------|-------------|
| | % | % | % | % | % |
| Mag. Conc. —30 + 100 mesh | 39.8 | 48.2 | | 0.14 | 8.1 |
| Mag. Conc. —100 + 200 mesh | 12.7 | 61.3 | | 0.11 | 3.4 |
| Mag. Conc. —200 mesh | 12.9 | 64.6 | | 0.10 | 2.2 |
| Comp. —30 mesh Mag. Conc. | 65.4 | 54.0 | 95.2 | 0.12 | 6.0 |
| Non-Magnetic | 34.6 | 5.1 | 4.8 | 0.19 | 23.2 |
| No Beneficiation | 100.0 | 37.0 | 100.0 | 0.15 | 12.0 |

Separation at Finer Sizings

Separation at finer sizings than those shown was not attempted, but a study of the table of results of beneficiation at minus 30 mesh gives a clear indication of the trend which would be followed. Beneficiation after grinding to minus 100 mesh would result in a concentrate of the order of 62% iron, 0.1% sulphur and 3.0% acid insoluble. Similarly, separation of minus 200 mesh feed would result in a concentrate of approximately 65% iron, 0.1% sulphur and 2.0% insoluble matter. Iron recoveries of 95% are indicated.

Mineragraphic Investigation

Mineragraphic investigation has revealed that a high proportion of composite grains of magnetite, with silicate gangue minerals, exist in the minus 200 mesh fraction.