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FUEL RESEARCH INSTITUTE OF SOUTH AFRICA.

MEMORANDUM NO. 34 OF 1963.

MAGNETITE INVESTIGATION.

BY:

E.L. GERICKE.

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In view of criticism on the work previously done on the Pilot Plant the flow sheet of the experimental set-up will be altered and the experiments will be repeated.

Two visits were paid to Klippoortje Colliery where the management state that they cannot get their overdense medium above 1.65 s.g. and their losses are excessive when using Foskor magnetite. A small magnetic separator was installed there for a period and the effluent passed through it. The losses with Foskor magnetite were then very much less but they still could not keep the s.g. of the overdense medium suspension up. Referring to the magnetic field strength tests done it will be seen that the strength of the magnets at Klippoortje are very much weaker than those at T.N.C. This leads one to believe that with strong magnets there will be no difference (noticeable) between the two kinds of magnetite but with weaker magnets the properties of Foskor magnetite will deteriorate. The reason, this statement is made, is that at T.N.C. the losses with Ermelo magnetite averaged 0.36 lb./ton over a period of one year. Recently they switched over to Foskor magnetite and the losses increased to 0.44 lb./ton which is to be expected because they increased their gravity from 1.65 to 1.70 when they changed to Foskor. It may be mentioned here that T.N.C. keep very accurate records and the operation of the plant leaves nothing to be desired which is not the case on other collieries.

In view of the above observation it is suggested that a series of tests be run with Ermelo and Foskor magnetites at different field strengths of the magnets in the magnetic separator.

At Klippoortje Colliery the water used in the washery comes from a pan and the management states that when adding NaOH immediately before the magnetic separator the losses are increased greatly. The water may have an effect on the magnetite and samples were taken of the fresh water and the rinsing water. It is suggested that a study be made of the effect of different kinds of water on the magnetic properties of the magnetite. Solutions can be made up to do this work.

Altogether ten washeries were visited where heavy medium suspension plants are in operation. They are as follows

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with remarks on each.

1. Alpha Anthracite.

No records are kept here. Ermelo magnetite is used and the operator has not the faintest idea of how much he uses.

2. Hlobane Colliery.

This plant is operating very well and the management states that their losses do not increase when using Foskor magnetite. They have no trouble even when washing in the Wemco drum at a s.g. of 1.90. They have had their overdense s.g. up to 2.40 with Foskor. This colliery washes at three different s.g.'s. Accurate records are kept and their losses are 1.5 lb./ton which is good.

3. Natal Ammonium Colliery.

A Drewboy washer is installed here and Foskor magnetite is used. The consumption of magnetite is 0.45 lb./ton. They have not experienced excess losses with Foskor magnetite. This plant is operating extremely well and good records are kept.

4. Natal Anthracite Colliery.

This colliery is operating on Foskor magnetite and state that their losses are lower with Foskor magnetite. They state that they have already had Ermelo magnetite with as much as 15% non-magnetic material. Good records are kept here and their losses are 0.55 lb./ton.

5. Enyati Colliery.

Here Ermelo magnetite is used and the losses are 0.6 lb./ton. The records are not too accurate. Initially Foskor magnetite was used and they changed to Ermelo simply because they were told to do so and for no apparent reason.

6. Elandsberg Anthracite Colliery.

Here Foskor magnetite is used but no accurate check is kept. After going through the records it was estimated that the losses were about 0.7 lb./ton.

7. Indumeni Colliery.

Here Ermelo magnetite is used. No accurate check is kept but from records which were made available the losses are in the region of 0.7 lb./ton. They have never used Foskor magnetite because they were told that it is no good.

8. Durban Navigation Colliery.

Here only Ermelo magnetite is used and the reason for

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this is that they only have a very small ball mill. The losses are 2.98 lb./ton and this increases to 3.5 lb./ton when there is an excessive amount of fines in the coal. This plant is heavily overloaded and this is the main reason for the high losses.

9. Klippoortje Colliery.

This has already been dealt with. The records kept on this colliery as well as the operation of the plant itself, leave much to be desired.

10. Transvaal Navigation Colliery.

This is the best operated colliery of all in every respect. The losses with Ermelo magnetite are only 0.36 lb./ton at 1.65 s.g. and 0.44 lb./ton with Foskor at 1.70 s.g. which is to be expected.

In view of the above findings it is suggested that letters be written to the above collieries asking them to keep accurate records of magnetite consumption pointing out that it is in their own interest and that it will also assist the Institute in this investigation.

While it is not the province of the Institute to consider the commercial side of any operation the following development is of interest.

Foskor magnetite is railed from Mica Siding in the N.E. Transvaal. The railage to the various collieries is considerable. Ermelo magnetite is first railed to Germiston where it is milled and then railed to various collieries. Ermelo magnetite is now being milled on the spot to about 50%-325 mesh. It is railed direct from Ermelo to the collieries effecting a considerable saving in railage. Ermelo magnetite can now be banded on the Collieries at R3.00 cheaper than Foskor magnetite. In addition to this saving the milling time of Ermelo magnetite is only 1 hour as compared to $3\frac{1}{4}$ for Foskor, a very considerable saving in itself. In view of this development it is likely that all the collieries will be using Ermelo magnetite in the future. Sample consignments have already been sent to Hlobane and Elandsberg. In the Witbank area the saving will be even greater.

E.L. GERICKE.

TECHNICAL OFFICER.

9th September, 1963.

PRETORIA.