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-RESEARCH AND DEVELOPMENT BRANCH-

METALLURGICAL SECTION.

SULPHURIC ACID LIMITED - PYRITE FROM EFFLUENT.

FIRST REPORT.

by

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-Abstract-

Attempts to separate fine pyrite from a wet scrubber effluent using hydraulic cyclones were not successful. Alternative methods are suggested.

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1. SUMMARY.

In the drying section of the production plant of Sulphuric Acid Limited some fine pyrite is lost in the effluent from a wet "Field" type gas scrubber.

A sample of this effluent was submitted with the request that hydraulic cycloning be tried in an attempt to recover the pyrite as a product thick enough to be returned and mixed with the initial feed to the driers. The overflow from the cyclone separation would have to be free of solids and suitable for reuse or rejection as may be required.

Two stage cyclone separation was tried. The material was fed to a microcyclone and overflow and underflow products produced. Unfortunately no significant separation could be achieved and although a thickened product was delivered at the underflow, approximately 60 percent of the fine pyrite reported in the overflow. The microcyclone underflow was treated in a larger cyclone but at no stage could "rope" discharge conditions be obtained.

The test work indicated that cyclone treatment is unsuited to the recovery of pyrite. A continuous centrifuge may be suitable for such a separation.

2. INTRODUCTION.

At the acid production plant of Sulphuric Acid Limited the pyritic concentrate from Nairne is dried prior to roasting. The air from the driers is forced through a multicyclone which removes most of the solid material carried over with the air. However the air discharged from the cyclone still contains some very fine material which is removed in a wet "Field" type air scrubber. At present there is no way of automatically returning this fine material to the circuit. This material, which assays about 28 percent sulphur, represents one percent by weight of the feed to the drier.

It was suggested by Sulphuric Acid Limited that simple hydraulic cyclone treatment might recover the pyrite in a product suitable for returning to the plant and also produce a clear effluent for reuse or disposal.

3. MATERIAL EXAMINED.

The following information on material similar to the sample submitted was supplied by Sulphuric Acid Limited.

Chemical Assay - Sulphur 28 percent.

Sizing (Infrasizer Analysis).

Cone.	Size range (Microns).	Percent Weight.
1 & 2.	+ 47	2
3.	- 47 + 33	5
4.	- 33 + 23	10
5.	- 23 + 16	16
6.	- 16 + 12	19
7.	- 12	48

4. EQUIPMENT USED.

(a) 1.2 inch "Raffinot" microcyclone.
(b) 3 inch cyclone.

5. EXPERIMENTAL PROCEDURE and RESULTS.

The sample was pulped with water to approximately 11 percent solids, and fed to the microcyclone at maximum operating pressure, the percent solids in the overflow and underflow being recorded.

The pulp was then diluted to 7 percent solids and note made of percent solids in the underflow and overflow. This was repeated at 5.5 percent solids. The results of these tests are given in Table 1.

TABLE 1.

Results of Microcyclone Separation.

Factor.	Test 1.	Test 2.	Test 3.
Feed rate (galls/min.).	3.0	3.0	3.0
Pressure (p.s.i.).	52	52	52
Feed density (percent solids).	11.0	7.0	5.5
Underflow density " ").	43.0	39.0	37.0
Overflow density " ").	6.0	4.0	3.0
Percent Weight solids in underflow.	45.0	43.0	40.0
Percent Weight solids in overflow.	55.0	57.0	60.0

These results show that in each test less than 50 percent of the fine pyrite reported in the underflow fractions.

The feed and the overflow fractions from test 3 were assayed for sulphur and gave the following results:

Feed.	26.2 percent sulphur.
Overflow.	20.8 percent sulphur.

The underflow product obtained in test 3 was used as feed to a 3 inch cyclone, the object being to produce a "rope" discharge at the underflow outlet. It was found impossible to obtain a rope discharge under any conditions. Hence no results are quoted for this section of the work.

6. CONCLUSIONS.

Hydraulic cycloning of the effluent material did not recover the pyritic content of the effluent in a form suitable for re-introduction to the feed to the drying kiln. This method also failed to give an overflow product suitable for disposal, should this be necessary.

As requested by Sulphuric Acid Limited the work carried out was of a limited nature, being confined to the application of hydraulic cyclones. It is suggested however that the problem warrants a more complete investigation. Other methods of separation such as the use of a continuous centrifuge should be investigated.