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AUSTRALIAN MINERAL DEVELOPMENT LABORATORIES.

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PROJECT 15/1.

S.A. DEPARTMENT OF MENES.

CROMER C CLAY, WILLIAMSTOWN

FIRST REPORT.

BENEFICIATION.

by

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This work describe work undertaken at the request of the South Australian Department of Mines. The experimental work was carried out under the general supervision of D.W. Read, Chief Metallurgist. Acknowledgement is made to A. Tynan for X-ray analysos.

Issued by

T.A. Barnes.

Acting Director, A.M.D.L.

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1. Summary.

A sample of a white clay deposit known as Cromer 'C' in the Mt. Crawford area was submitted by Mr. Chamberlain of Clay Supplies Limited with a request for preliminary beneficiation tests.

Roll crushing, drying and milling with air-classification is recommended as a satisfactory method of treatment. The product obtained from such treatment is a high quality kaolin, quartz-free and of good colour.

2. Introduction.

Information was sought by Clay Supplies Limited concerning kaolin deposits on the leases at Mt. Crawford previously held by S.A. Silicates Limited and known as Cromer 'C' Deposit.

3. MATERIAL EXAMINED.

The sample submitted was reported to be representative of the Cromer 'C' deposit near Warren Reservoir. Approximately 1 ton of run of mine clay up to 6" size was received on the 29th May, 1959. Large pieces of quartz were present in the clay.

4. Equipment Used.

Jacques Jaw Crusher

Roll Crusher 10" diam. x $5\frac{1}{2}$" face

Raymond No. 0000 Pulveriser

"Gayco" Centrifugal Air-Separator Size 18.

5. Experimental Procedure & Results.

A representative portion of the undried raw clay was screened on a $\frac{1}{4}$ inch mesh and the oversize reduced to minus $\frac{1}{4}$ inch by rolls-crushing. The moisture content of the sample was 25 per cent.

A sample of minus $\frac{1}{4}$ inch undried clay was agitated in water containing a dispersant. The resulting pulp was then screened on 30, 72, 200 and 300 B.S. screens. The sizing of the dispersed pulp was as follows:-

B.S. Screen.	% Weight.
- ¼ + 30 mesh	15.0 (mainly clean quartz)
- 30 + 72 "	1.8
- 72 + 200 "	2.3
-200 + 300 "	2.3
- 300 "	78.6

5. Experimental Procedure & Results (Cont).

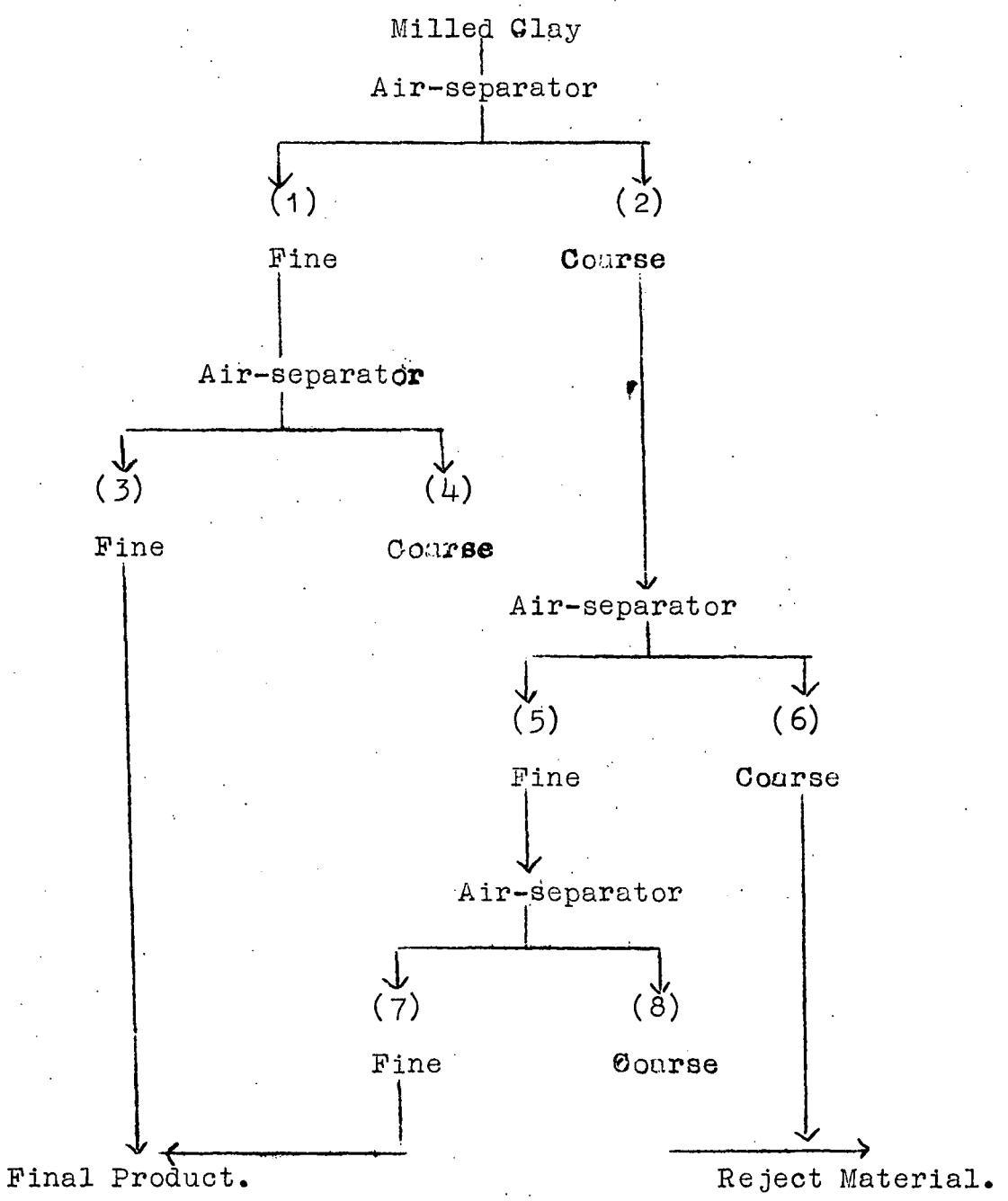
The minus 300 mesh fraction had an average particle size of 1.5 microns and X-ray diffraction showed that the fraction consisted almost entirely of crystalline kaolinite. The only other mineral detected was quartz this being present in a quantity less than one-half per cent.

It was then decided to try air-classification as a means of separating the quartz from the clay as it was coarse enough to be rejected by this method.

5.1. Air-Classification.

Approximately 50 lb. of the minus ¼ inch raw clay was dried at 110° C and hammer-milled in a Raymond No.0000 Pulveriser. After a number of preliminary trials to determine the best conditions a portion of the milled clay was treated in an 18" diameter Gayco air-separator as outlined in Flowsheet 1. The feed rate to this unit was 50 lb. per hour.

FLOWSHEET 1.



The operation of flowsheet 1 resulted in a final product (No. 3) representing 62.5 per cent by weight of the feed.

Sizing on this product was:-

B.S. Screen.	% Weight.
+ 200	0.15
- 325	99.85

The plus 200 mesh material consisted of large (10 - 20 mesh) pieces of clean quartz which remained in the sample because the Gayco separator was used as a batch unit. Such material would not normally be present in the fine product in closed circuit treatment. This coarse quartz was therefore removed by screening prior to the determination of free silica. The final product was examined by X-ray diffraction and revealed that the sample consisted of kaolin with a trace of illite. No quartz was detected.

The final product gave a reflectance value of 92.0 per cent compared with that of magnesium carbonate. The clay appeared to suffer some contamination during the test work as a colour determination made previously on the freshly washed clay gave a reflectivity of 96.0 per cent.

Contamination could have been introduced both in the Raymond mill and the Gayco unit. It would be important therefore in plant treatment to ensure that proper precautions, such as the use of stainless equipment were taken to minimise contamination of the final product.

A sample of the final test product from flowsheet 1 was tested for grit content using a method similar to that used by some paper manufacturers. This consists of stirring 100 grams of screened clay (minus 200 mesh) in a 5 litre beaker with water to a height of seven inches from the bottom of the beaker, allowing a settling time of 4 minutes and decanting the liquor from the solids. This procedure is repeated until the liquor is clear. The residue is weighed and examined for grit.

The sample tested by this method gave a residue of 2.5 per cent by weight and when examined under the microscope showed a number of specks of rutile and some other dark mineral. When moistened and rubbed between glass some grittiness was apparent in the residue. The amount of grit may however be within the limits set by the paper industry.

6. Conclusions.

The tests show that a high quality white clay can be obtained by air-classification. The product should have a ready market in the paper or rubber industries if the grit content is not considered too high. The colour of the product is exceptionally good.

Quartz was originally present mainly as large lumps but, because of the presence of similar sized lumps of hard clay, these could not be screened out at a coarse mesh without a large loss of clay. The quartz is however rejected in the coarse product from air-classification and no disadvantages should be incurred by use of hammer milling.

It is expected that recovery of clay in actual plant operation using air-classification in closed circuit with suitable milling, would be better than that obtained in the batch tests.

Wet cyclone treatment of the raw clay was not investigated as a method of benefication as it is doubtful if this method would give better results than dry classification and it would have the disadvantage of costly drying of the finished product.

A sample of the final tests product is being forwarded to Clay Supplies Limited for possible appraisal by prospective consumers.