

Ottawa, Ont.

May 19, 1925

R E P O R T  
of the  
ORE DRESSING AND METALLURGICAL LABORATORIES

Report No. 231 A

The preparation of Volcanic Ash from Waldeck,  
Saskatchewan, for industrial purposes.

by R. K. Carnochan

---

Shipments: Two bags of volcanic ash, net weight 192½-lbs. were received January 8, 1925; and two bags, net weight 95-lbs. January 23, 1925, at the Ore Dressing and Metallurgical Laboratories. Both shipments were submitted by Mr. W. C. Vance of the Val-Kel Cleaners Limited, Swift Current, Sask., and were taken from the company's volcanic ash deposit near Waldeck, Sask.

Characteristics of  
volcanic ash submitted:

Size: Pieces broken to about 4 inches  
Colour: Light buff  
Weight: Very light  
Texture: Fine grained; the grains were not bonded together solidly; a powder could be produced by rubbing with the fingers; the ash could readily be cut with a knife.

Purpose of  
experimental tests:

Tests were desired to determine possible methods of crushing, grinding and classification, to produce various grades of products, which could be used in oil filtering, as hand cleaner, household cleanser, and metal polish.

Experimental tests  
on shipment no. 1:

After selection of a few specimens, the remaining 192-lbs of shipment no. 1 was crushed by means of a jaw crusher and rolls to all pass an 8 mesh screen. The -8 mesh material was used in making grinding tests with a Raymond grinder in

231 A

which an effort was made to grind to almost all -48 mesh, and have as much as possible +100 mesh. The ground product from the Raymond was put through a Gayco air separator so as to separate it into -48+100 and -100 mesh products.

Summary: The tests made on shipment no. 1 show:

1. The ash crushed very nicely in the jaw crusher
2. Rolls are unsuited for the crushing of this material, as the tendency is for the ash to form cakes which do not go through the screen or crush up when re-run through the rolls.
3. The Raymond grinder can be adjusted to take material -8 mesh and give a product:

|       |           |
|-------|-----------|
| 0.2%  | +48 mesh  |
| 26.8% | -48+100 " |
| 73.0% | -100 "    |

4. The Gayco air separator gives a good fine product :

|       |           |
|-------|-----------|
| 5.4%  | +100 mesh |
| 94.6% | -100 "    |

The coarse product is not very good, as it tests :

|       |           |
|-------|-----------|
| 24.8% | +100 mesh |
| 75.2% | -100 "    |

The trouble in the operation of this separator on the material is that the ash keeps breaking up as it is going through, so that there is always fines in the coarse product. When this product is re-run five times, as was done to clean the fines out, there results a very small amount of coarse product.

Experimental tests on shipment no. 2: Seventy pounds of shipment no. 2 was crushed in a jaw crusher to 1½", and then crushed in a hammer mill to all pass a 6 mesh screen. The hammer mill product was screened and gave:

|         |            |
|---------|------------|
| 18 lbs. | -6+10 mesh |
| 24 "    | -10+48 "   |
| 24 "    | -48 "      |

The -10+48 was crushed in a Raymond grinder to nearly all pass 48 mesh and have as much as possible +100 mesh. The product from the Raymond mill was mixed with the -48 mesh material from the screen, and the mixture separated in a Gayco air separator into:

|          |          |
|----------|----------|
| 0.5 lbs. | Oversize |
| 46.5 "   | Fines    |

A screen test on the oversize shows:

|       |         |      |
|-------|---------|------|
| 18.4% | +48     | mesh |
| 41.4% | -48+100 | "    |
| 40.2% | -100    | "    |

A screen test on the fines shows:

|       |         |      |
|-------|---------|------|
| 2.5%  | +48     | mesh |
| 6.4%  | -48+100 | "    |
| 91.1% | -100    | "    |

Summary:

1. The hammer mill is well adapted to the crushing of the ash.
2. The Raymond grinder takes the -10+48 mesh product from the screen and gives a product:

|       |         |      |
|-------|---------|------|
| 7.3%  | +48     | mesh |
| 7.6%  | -48+100 | "    |
| 84.6% | -100    | "    |

3. As in the test on shipment no. 1, the Gayco air separator gave a good fine product. The coarse product was better than that obtained from shipment no. 1, as it tested :

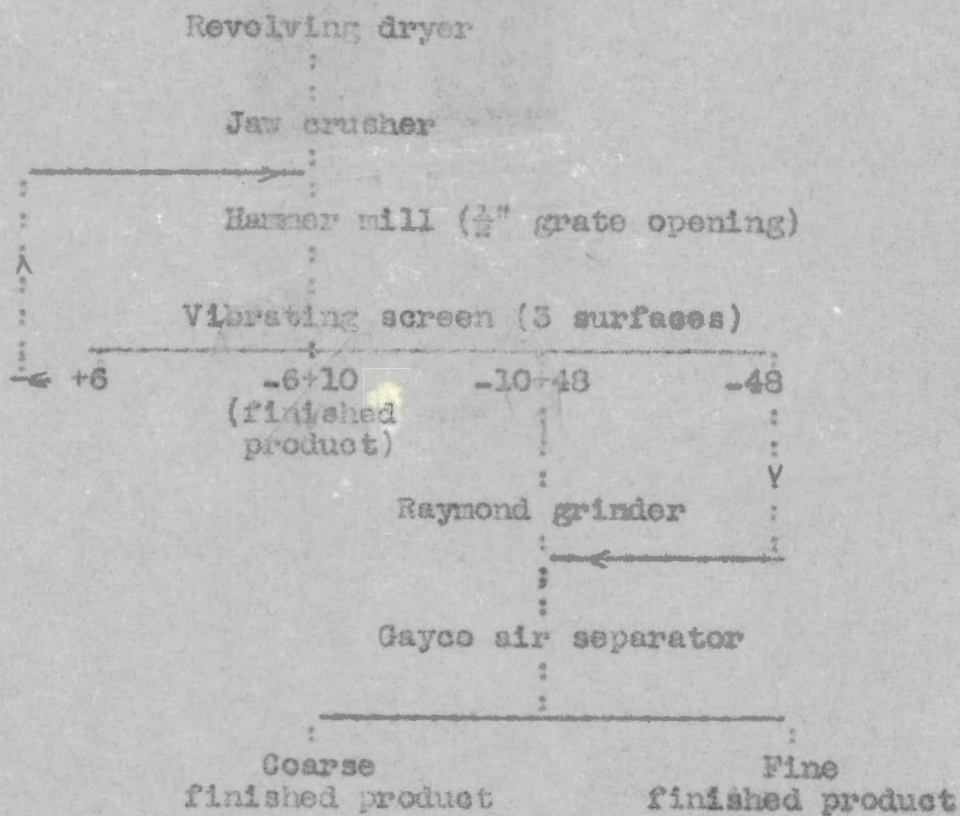
|       |         |      |
|-------|---------|------|
| 18.4% | +48     | mesh |
| 41.4% | -48+100 | "    |
| 40.2% | -100    | "    |

This is 59.8% +100 mesh, whereas, the coarse from shipment no. 1 is only 24.8% +100 mesh. This improvement is due to the fact that the proper setting of the machines had been determined when working on the first shipment

The ash keeps breaking up when put through the Gayco air separator, and this results in a very small amount of coarse being produced. The Gayco air separator used was a small one, and in commercial practice where a larger machine would be used, one pass instead of five as used in these tests, would be sufficient to secure a coarse product free of fines. The reduction in the number of passes would result in an increase in the amount of coarse from the separator, as the ash would be handled less, and would not break up as much

Conclusions:

1. The following flow sheet is recommended for the dry crushing of the volcanic ash:



2. Small tests made on the volcanic ash show that it is very porous and absorbs a lot of moisture, and that it is consequently very difficult to dry, hence the dryer installed should be large enough to handle a material of this nature at the required capacity.

3. The above flow sheet would give a -6+10 mesh product suitable for oil filtering, a coarse product from the air separator suitable for making a hand cleaner, and a fine product for making household cleanser. The tests on shipment no. 2 show that these products would be produced in the following proportions:

|                       |       |          |        |
|-----------------------|-------|----------|--------|
| -6+10 mesh            | .. .. | 18.0 lbs | 25.7%  |
| Air separator, coarse |       | 0.5 "    | 0.7%   |
| " " fines             |       | 51.5 "   | 73.6%  |
| Feed                  | .. .. | 70.0 "   | 100.0% |

In the above table it is assumed that the dust loss in the tests would be fines, and that in regular mill work only a small amount would be lost in dust. In regular mill work with a large air separator, more coarse material would be produced and less fines, because only one pass would be needed, and the ash would break up less.

4. If a very fine product was desired for metal polish, or any other purpose, a part of the fines from the air separator would be re-run, or put through a second air separator, so as to give a very fine product.