

UPGRADING OF GAFSA PHOSPHATE BY CALCINING
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by

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Introduction

Mr. R. Dumon, Manager, and Mr. Marcel Solignac, Consultant of Society Anonyme, Paris, France, asked the Asheville Laboratory to upgrade Gafsa, Tunisia phosphate ore by calcining to 75 percent BPL. Since Gafsa phosphate seems very similar to North Carolina phosphate, the Asheville Laboratory asked for samples to define the problem during a short period of test work.

Samples

Two barrels of about 150 pounds each of moist phosphate material were received. The ore as received had 15 percent moisture and size distribution and chemical analysis were determined as follows.

<u>Gafsa Phosphate Ore</u>							
<u>Size</u>	<u>% Weight</u>	<u>% P₂O₅</u>	<u>% BPL</u>	<u>% CaO</u>	<u>% Insol.</u>	<u>CaO/ P₂O₅</u>	<u>P₂O₅ Distribution</u>
+14 Mesh	1.0	29.0	63.3	49.6	1.1	1.72	1.0
-14+28	2.2	30.8	67.3	49.0	0.9	1.58	3.2
-28+65	22.8	31.2	68.2	49.1	0.7	1.57	26.7
-65+150	56.2	31.1	68.0	48.6	0.7	1.57	57.3
-150+200	4.2	29.9	65.3	45.6	6.1	1.53	4.1
-200	13.6	17.4	38.0	27.9	33.2	1.60	7.4
Head	100.0	28.3	61.8	45.4	4.3	1.60	99.7

Test Work and Results

Five hundred gram-samples of material as received were wet scrubbed and deslimed on 200 mesh. By removal of minus 200 mesh material, high in silica and clay, the phosphate ore is upgraded to 30.8 percent P_2O_5 or 67.3 percent BPL with only a 6.6 percent loss in P_2O_5 . The plus 200 mesh material was then calcined for one and one-half hours at 1750° F. in an electric muffle furnace. Calcining effected a weight loss of nine percent with an increase in P_2O_5 to 34.2 percent. The minus 14 plus 200 mesh fraction contained 95.6 percent of the phosphate value in the deslimed feed or 89.3 percent of the phosphate value in the material as received. The size distribution and chemical analysis of deslimed and calcined Gafsa phosphate ore are as follows.

Deslimed and Calcined Gafsa Phosphate Ore

<u>Size</u>	<u>% Weight</u>	<u>% P_2O_5</u>	<u>% BPL</u>	<u>% CaO</u>	<u>% Insol.</u>	<u>CaO/ P_2O_5</u>	<u>P_2O_5 Distribution</u>
+14 Mesh	1.2	31.0	71.1	50.0	8.9	1.61	1.1
-14+28	3.0	35.2	76.9	53.4	1.0	1.52	3.1
-28+65	27.1	35.0	76.5	54.1	0.5	1.55	27.8
-65+150	59.6	34.2	74.7	53.9	0.8	1.58	59.7
-150+200	4.9	34.6	75.6	53.2	0.7	1.54	5.0
-200	4.3	27.4	59.9	51.0	0.8	1.86	3.0
Head	100.0	34.2	74.7	-	-	-	100.0
-28+200	94.6	34.5	75.4	-	-	-	95.6

It was important to remove the minus 200 mesh fraction before calcining because the phosphate pebbles sintered together when calcined with the

fines left in the ore in a non-turbulent calciner bed. It might be possible to remove the fine clay-like material in the drying compartment of a specially designed fluo solid, multi-compartment calciner before calcining and sintering temperatures are reached. Without use of water the upgrading of Gafsa phosphate by sizing and calcining could be so achieved. Some test work is planned in a specially built fluo solid calciner at the Asheville Laboratory.

Summary

Samples of Gafsa phosphate material could be upgraded to the desired BPL content of 75 percent by wet scrubbing, sizing and calcining. Eighty-nine percent of the phosphate values in the material could be recovered.