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PRODUCTION OF HYDRATED LIME FROM MURRAY BRIDGE LIMESTONE.

by

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PRODUCTION OF HYDRATED LIME FROM MURRAY BRIDGE LIMESTONE.

-Abstract-

Calcination and hydration tests on samples of Murray Bridge Limestone indicate 1100°C as the best calcination temperature. The products contained 72.4, 76.0 and 75.2 per cent calcium hydroxide respectively.

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1. Summary.

Calcination and hydration tests have been carried out on the samples of Murray Bridge limestone marked nos 6,7 and 8.

The most suitable calcination temperature was found to be 1100°C.

Samples 6,7 and 8 fired at this temperature yielded, on hydration, products containing 72, 76 and 75 per cent calcium hydroxide respectively.

2. Introduction.

Three samples of limestone submitted by the Engineering Geology and Mineral Resources Section have been tested to determine their suitability for the production of hydrated lime. The programme is an extension of the work reported in the Report R.D. 20.

The following information has been obtained from each sample:

Calcination.

(a) Burning Procedure.
(b) Loss in Weight.

Hydration

Physical characteristics of the products
(a) Colour
(b) Analysis.

3. Material Examined.

Three samples marked Nos, 6,7 and 8 were received as lumps of rock approximately three inches in diameter.

The locality and description of each of the samples is given below:

Sample 6,

This sample is located in section 145, Hundred of Bordott, County of Russell. The quarry, said to be Chapman's Quarry, is east of the river and north of the bridge.

The sample consisting of buff coloured dense crystalline limestone, was taken 15 to 20 feet above the floor of the quarry.

There was 15 to 20 feet of more earthy material above this point but it was not sampled.

Sample 7,

This sample is located in Section 138 Hundred of Bordott, County of Russell. The samples were collected from the vicinity of old lime kilns near Log Flat, which is east of the river and south of the bridge.

This limestone is said to have been burnt by a Mr. Pitt producing excellent building lime.

Sample 8,

This sample is located in Section 84 Hundred of Mobilong, County of Sturt. The quarry is west of the river and approximately 2 miles, north-east of Murray Bridge Post Office.

This sample is buff coloured dense, crystalline bryozoal limestone. The quarry is operated by F.J. Cawte Industries Limited to produce road metal "carbonate of lime".

4. Equipment Used.

A muffle furnace was used for the firing tests and the brightness of each of the products was compared with a standard white tile using a E.E.L. Reflectometer.

5. Experimental Procedure and Results.

5.1 Calcination Tests.

5.1.1 Burning Procedure.

Four two inch cubes were cut from each sample and calcined at 900, 1000, 1100, and 1200 degrees C.

Each batch of samples was placed in a cold muffle furnace, the temperature of which was raised to the required level in approximately two hours. The muffle was maintained at the calcination temperature for three hours, then turned off and allowed to cool overnight.

The samples were removed from the furnace at approximately room temperature.

5.1.2 Loss in Weight.

The samples were weighed before and after calcination to determine the loss in weight.

The weight of the calcined products is expressed as a percentage weight of the original material. Theoretically 100 parts of pure $CaCO_3$ should calcine to 56 parts of CaO

The results are shown in Table 1.

Table 1.

PERCENTAGE WEIGHT AFTER CALCINATION.

Sample	Calcination Temperatures.			
	900°C	1000°C	1100°C	1200°C
6	92.4	66.0	61.0	58.5
7	81.8	60.5	59.5	58.5
8	76.7	61.0	58.5	59.0

Calcination appears to be complete at 1100°C.

5.2 Hydration.

Water was added to the calcined product until hydration appeared to be complete and then 50 per cent of water was added in excess. The hydrated lime was dried at 210 degrees F for 24 hours and then weighed.

The increase in weight is expressed as a percentage of the calcined products; theoretically 100 parts of CaO should produce 133 parts of $Ca(OH)_2$.

The results are shown in Table 2.

Table 2.

-WEIGHT OF HYDRATE FORMED EXPRESSED AS A PERCENTAGE OF-QUICKLIME WEIGHTS.

Sample	Calcination Temperatures.			
	900°C	1000°C	1100°C	1200°C
6	102	119	127	128
7	107	125	128	127
8	119	125	130	128

5.3 Colour of the Products.

An EEL reflectometer was used to compare the light reflected from each sample with a white tile taken as having a standard reflectance of 76.5 per cent.

The results are shown in Table 3.

Table 3.

-PERCENTAGE REFLECTANCE OF LIGHT FROM HYDRATED PRODUCT.-

Sample	Calcination Temperatures.			
	900°C	1000°C	1100°C	1200°C
6	53	67.5	73.5	73.0
7	63	68.0	68.0	70.5
8	67.5	73.5	73.0	73.0

All the products with the exception of those calcined at 900°C were slightly off-white, while those calcined at 900°C were dirty and granular due to incomplete calcination.

5.4 Analysis of Products.

The hydrated products from each test were submitted for analysis and the results are set out in Table 4.

Table 4.

ANALYSIS OF HYDRATED PRODUCTS.

Sample No.	Calcination Temp. °C	Percentage Weight $Ca(OH)_2$
6	900	14.0
6	1000	60.0
6	1100	72.4
6	1200	73.6
7	900	20.6
7	1000	72.8
7	1100	76.0
7	1200	78.0
3	900	31.2
8	1000	72.4
8	1100	75.2
8	1200	72.7

The hydrated products from all the samples calcined at 1100°C were submitted for complete analysis.

The results are set out in Table 5.

Table 5.

COMPLETE ANALYSIS OF HYDRATED PRODUCTS.

Sample	$Ca(OH)_2$	$CaCO_3$	SiO_2	Al_2O_3	Fe_2O_3	MgO	H_2O at 100°C
6	72.4	8.6	11.7	1.2	1.0	2.7	2.4
7	76.0	9.1	9.5	0.8	1.4	0.9	2.3
8	75.2	11.8	6.8	0.5	1.7	0.8	3.2

6. Discussion.

The most suitable calcination temperature appears to be 1100°C and the products from that calcination were off-white due to the presence of large amounts of silica alumina and iron.