

A Rotary Kiln Lime Plant

Installation at Abadan
Sea Shells as a Raw Material

THE burning of lime in rotary kilns is a well-established practice, but a recent installation by Edgar Allen & Co. Ltd., for the Anglo-Iranian Oil Co. Ltd., at their refinery at Abadan is of particular interest on account of the unusual raw material—sea shells—which the plant is designed to utilize. Abadan is situated on the river Shatt-al-Arab, which is the confluent of the Tigris and the Euphrates, about 40 miles north east of the Persian Gulf.

The plant was installed for the purpose of providing milk of lime for the oil refinery and also lime for building purposes.

Raw Material

The sea shells are deposited in large quantities on the shore of the Persian Gulf. They are brought to the works in barges. The size of the shells varies between about 2 in. and $\frac{1}{2}$ in., and even smaller. On a sieving test it was found that approximately 40 per cent. passed through a sieve with $\frac{1}{2}$ in. square holes.

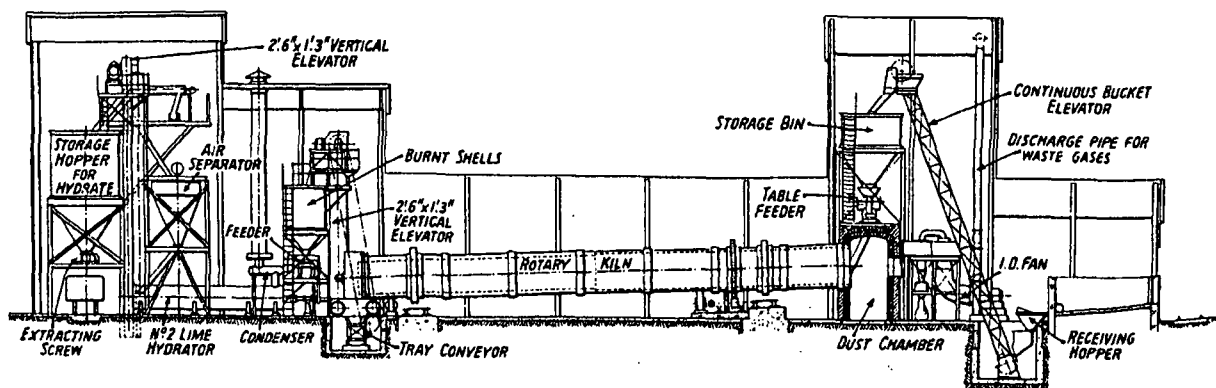
The chemical analysis proves that the shells are fairly pure calcium carbonate. The composition is:—

	Per cent.
Loss on ignition	43.03
Silica	1.10
Alumina	0.74
Ferric oxide	
Lime	53.00
Magnesia	1.56
Difference	0.57
Total	100.000

The shells burnt in a rotary kiln are hydrated and the hydrate freed from nibs and impurities by passing it through an air separator. The arrangement of the lime burning plant, the hydrator and the air separator is illustrated in Fig. 1.

The raw shells are lifted into a receiving hopper and are lifted by means of an elevator into an overhead storage bin placed over the kiln feeder. The bin is filled every morning in 2 to 3 hours and has sufficient capacity to supply the kiln with raw material for 24 hours.

Fig. 1—Elevation showing the arrangement of lime-burning plant, hydrator and air separator



Rotary Kiln

A rotating table feeder under the bin extracts the raw shells and feeds them at the required rate into the rotary kiln through an inclined pipe. The kiln is a steel tube lined with firebricks, and is slightly inclined. It rotates slowly on two sets of rollers and bedplates, being driven by a variable speed motor. The raw shells fed in gravitate slowly to the discharge end as a result of the inclination and rotation of the kiln, and the hot combustion gases from the firing equipment, which is fitted at the lower end, travel in the opposite direction, gradually heating the shells to the calcining temperature.

The inside of the kiln is fitted with a lining of refractory material and an insulating lining between the steel shell and refractory lining. For European conditions an insulation is recommended principally for the purpose of reducing the heat lost by radiation and thus for fuel economy, but for climates such as at Abadan, where the shade temperature in the summer reaches 125° F., it is also essential for the preservation of the plant.

The waste gases from the kiln pass through a brick dust chamber and through a cyclone dust collector, and are exhausted into the atmosphere by an induced draught fan. The fan is driven by a variable speed motor for the purpose of adjusting the speed in accordance with the volume of gas to be handled.

Oil Firing Equipment

Being located at an oil refinery, the kiln is, of course, fired with oil fuel. This fuel lends itself exceptionally well for burning lime because the firing is under close control, no impurity is introduced into the lime, and the calcining temperature can be maintained between very narrow limits. The oil is atomised in the burner by compressed air, which may be considered extravagant, but ensures very thorough atomisation besides being reliable, particularly when attended to by unskilled labour. The oil used has a viscosity of 140 secs. Redwood No. 1 at 100° F. and a specific gravity of 0.913, so that heating is not necessary.

The firing equipment comprises the burner, an oil pump with filters on the suction and delivery sides and an air compressor, control valves and gauges.

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