

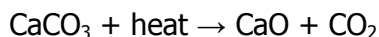
LIME KILN

1. INTRODUCTION:

Burnt Lime also called as quick lime or unslaked lime is made out of lime stone deposits which are wide spread throughout the country. The burnt lime is extensively used as a mortar in the construction of building by mixing in with suitable proportion of sand and surkhee of burnt clay as aggregate. It is also used for white washing of houses and building. Iron and steel plants, and foundries use lime as a fluxing agent in considerable quantity. Some drugs and pharmaceuticals, paper industry, pesticides formulations and other chemical processing industries are using the unslacked lime.

2. PRODUCT & ITS APPLICATION:

A lime kiln is a kiln used for the calcination of limestone (calcium carbonate) to produce the form of lime called quicklime (calcium oxide). The chemical equation for this reaction is:



This reaction takes place at 900 °C (1650 °F; at which temperature the partial pressure of CO₂ is 1 atmosphere), but a temperature around 1000 °C (1800 °F; at which temperature the partial pressure of CO₂ is 3.8 atmospheres[1]) is usually used to make the reaction proceed quickly.[2] Excessive temperature is avoided because it produces unreactive, "dead-burned" lime. Slaked lime (calcium hydroxide) can be formed by mixing water with quicklime.

Types of kiln:

Permanent lime kilns fall into two broad categories: "flare kilns" also known as "intermittent" or "periodic" kilns; and "draw kilns" also known as "perpetual" or "running" kilns. In a flare kiln, a bottom layer of coal was built up and the kiln above filled solely with chalk. The fire was alight for several days, and then the entire kiln was emptied of the lime.

In a draw kiln, usually a stone structure, the chalk or limestone was layered with wood, coal or coke and lit. As it burnt through, lime was extracted from the bottom of the kiln, through the draw hole. Further layers of stone and fuel were added to the top.

3. DESIRED QUALIFICATIONS FOR PROMOTER:

Graduate in any discipline. Promoter with high skill of chemical processing and having contacts with building and construction industries is advantage.

4. MARKET POTENTIAL AND MARKETING ISSUES, IF ANY:

There is rapid development taking place in the construction of buildings in rural and urban areas, housing development programmes and industrialization activities throughout the country, burnt lime has a good demand. The main application of lime, used as a mortar in the construction of building, by mixing it in suitable ratio with sand and surkhee of burnt clay, white washing of house and buildings, iron and steel industries, fluxing agent in foundries, drugs paper and pharmaceuticals industries, some chemical industries are also using the lime as a chemical processing agent. The demand for this product is also increasing day-by-day. In the view of this, there is a very good scope for setting up some new units.

Burnt lime and hydrated lime are used in: the steel industry (as a flux), the pulp and paper industry (as a causticiser) , gold mining, road stabilization, water treatment, waste water treatment, fellmongery (to treat hides) and soil improvement.

5. RAW MATERIAL REQUIREMENTS:

Limestone is a sedimentary rock, made up mostly of the mineral calcite, a form of calcium carbonate, CaCO_3 . The calcium carbonate is originally produced by living animals (such as shellfish). Later, much of it goes into solution in sea water, and then is deposited as limestone. Calcium carbonate gets precipitated when the physical condition of the water changes. For example, if the concentration of CaCO_3 is high, then a temperature drop, or a pH (acidity) change, can cause precipitation.

Almost all the states in India produce some quantities of limestone, but about 75 per cent of the total production comes from Madhya Pradesh, Chhattisgarh, Andhra Pradesh, Rajasthan, Gujarat and Karnataka. Other limestone producing states are Tamil Nadu (Ramanathapuram, Tirunelveli, Tiruchirappalli, Salem, Coimbatore, Madurai and Thanjavur districts); Maharashtra (Yavatmal, Chandrapur, Nanded and Ahmednagar districts); Himchal Pradesh, (Bilaspur, Kangra and Chamba districts); Orissa (Sundargarh, Sambalpur and Kalahandi districts); Haryana, Assam, Meghalaya, Uttar Pradesh and Jammu and Kashmir.

6. MANUFACTURING PROCESS:

The limestone mined from quarry or rivers should be free from all defects and impurities, once washed and cleaned again for removal of dust particles. These stone blocks are crushed manually or by jaw crusher in sizes of 3 to 6 inches. Oil fired vertical shaft kiln (VSK) refractory lining inside portion having about 33 meter conical vertical chimney, is used for the firing or calcination of lime stone at a temperature of about 900 degree C. The chimney of VSK is so arranged that the speed of exhaust gases and fumes in the chimney may travel @ 9 to 12m/sec. The diameter of chimney is so calculated that the lower/bottom portion of chimney is one third of the total stack of chimney. Skip bucket with rope, which is driven by electric motor, is arranged for loading of stone pieces for firing of calcination. These stone pieces are loaded from the top of kiln, this process is done regularly as per the requirement of stone calcination. A cyclone or dust catcher is also arranged with a scrubber which collect about 50 to 80% dust particles and removed with scrubber. Approx. 4 kg. To 6 kg. Sludge/hr. is removed by this process which can be discharged to land fill. The firing is done with the help of burner. The firing is initiated from the bottom section of kiln and after a suitable interval the calcined lime is unloaded through the outlets provided at the bottom section of kiln. Property calcined lime is sorted out in different grades like A, B and C grade. Semi burnt lime stones are charged again in the kiln for calcination. The dust, clinkers ash and other harmful materials are removed from the finished product. Properly sorted lime is packed and stored for sale.

Qualified limestone (20 ~ 50 mm) are lifted by bucket elevator to top silo of pre-heater. There are two level indicators (up and down) controlling the feeding amount, then they are

separated averagely into pre-heaters' individual rooms. The limestone's temperature rises to about 900 °C heated by kiln flue gas of 1150°C, about 30% of them are decomposed, and they come into the rotary kiln by hydraulic rod, where the limestone decomposed into CaO and CO2. The decomposed limestone are put into the cooler, where its temperatures drops to 100°C and released. The hot air (600°C) will come to kiln after heat exchange, and mix with coal gas for mixture combustion. The exhaust gas is released by the blower into bag duster through multi-pipe cooler, then into the chimney through exhaust blower. The limestone from the cooler will be transported to the limestone final product silo through vibrating feeder, chain conveyor, bucket elevator, belt conveyor.

7. MANPOWER REQUIREMENT:

The enterprise requires 11 employees as detailed below:

Sr. No.	Designation of Employees	Salary Per Person	Monthly Salary ₹	Number of employees required				
				Year-1	Year-2	Year-3	Year-4	Year-5
1	Machine Operators	12,000	24000.00	2	2	2	2	2
2	Helpers	8,000	64000.00	8	8	8	10	10
3	Production supervisor	15,000	15000.00	1	1	1	1	1
4	Accounts/Stores Asst	12,500	25000.00	2	2	2	3	3
5	Office Boy	9,000	9000.00	1	1	1	1	1
	Total		137000.00	14	14	14	17	17

8. IMPLEMENTATION SCHEDULE:

The project can be implemented in 4 months' time as detailed below:

Sr. No.	Activity	Time Required (in months)
1	Acquisition of premises	1.00
2	Construction (if applicable)	1.00
3	Procurement & installation of Plant & Machinery	1.00
4	Arrangement of Finance	2.00
5	Recruitment of required manpower	1.00
	Total time required <i>(some activities shall run concurrently)</i>	4.00

9. COST OF PROJECT:

Sr. No.	Particulars	₹ in Lacs
1	Land	4.00
2	Building	12.50
3	Plant & Machinery	16.50
4	Furniture, Electrical Installations	1.65
5	Other Assets including Preliminary / Pre-operative expenses	1.98
6	Margin for Working Capital	50.00
	Total	86.63

10. MEANS OF FINANCE:

Bank term loans are assumed @ 75 % of fixed assets. The proposed funding pattern is as under:

Sr. No.	Particulars	₹ in Lacs
1	Promoter's contribution	21.66
2	Bank Finance	64.97
	Total	86.63

11. WORKING CAPITAL CALCULATION:

Sr. No.	Particulars	Gross Amt	Margin %	Margin Amt	Bank Finance
1	Inventories	24.00	0.25	6.00	18.00
2	Receivables	12.00	0.25	3.00	9.00
3	Overheads	14.00	100%	14.00	0.00
4	Creditors	-		0.00	0.00
	Total	50.00		23.00	27.00

12. LIST OF MACHINERY REQUIRED:

A detail of important machinery is given below: Power Requirement: 20 HP

Sr. No.	Particulars	UOM	Qty	Rate (₹)	Value
					(₹ in Lacs)
	Plant & Machinery / equipments				
a)	Main Machinery				
i.	Oil fired vertical shaft kiln	NOS.	1	800000	8.00
ii.	Jaw crusher for crushing	Nos	1	150000	1.50
iii.	Rotary self-driven for sieving	Nos	1	80000	0.80
b)	Ancillary machinery				
i.	Balance for weighing	Nos	1	75,000	0.75
ii.	Overhead water tank, generator, dust collectors, etc.	NOS.	1	15000	5.45
	<i>sub-total Plant & Machinery</i>				16.50
	Furniture / Electrical installations				
a)	Office furniture	LS	1	50000	0.50
b)	Stores Almira	LS	1	30,000	0.30
c)	Computer & Printer		L. S.	85000	0.85

Sr. No.	Particulars	UOM	Qty	Rate (₹)	Value
	<i>sub total</i>				1.65
	Other Assets				
a)	preliminary and preoperative				1.98
	<i>sub-total Other Assets</i>				1.98
	Total				1.98

13. PROFITABILITY CALCULATIONS:

Sr. No.	Particulars	UOM	Year-1	Year-2	Year-3	Year-4	Year-5
1	Capacity Utilization	%	60%	70%	80%	90%	100%
2	Sales	₹. In Lacs	120.00	140.00	160.00	180.00	200.00
3	Raw Materials & Other direct inputs	₹. In Lacs	102.66	119.77	136.88	153.99	171.10
4	Gross Margin	₹. In Lacs	17.34	20.23	23.12	26.01	28.90
5	Overheads except interest	₹. In Lacs	4.90	5.21	5.82	6.01	6.13
6	Interest	₹. In Lacs	6.50	6.50	4.33	3.25	2.60
7	Depreciation	₹. In Lacs	11.55	8.25	5.78	4.13	3.71
8	Net Profit before tax	₹. In Lacs	-5.61	0.27	7.19	12.63	16.46

14. BREAKEVEN ANALYSIS:

The project shall reach cash break-even at 30.20 % of projected capacity as detailed below:

Sr. No.	Particulars	UOM	Value
1	Sales at full capacity	₹. In Lacs	200.00
2	Variable costs	₹. In Lacs	171.10
3	Fixed costs incl. interest	₹. In Lacs	8.73
4	$BEP = FC / (SR - VC) \times 100 =$	% of capacity	30.20%