

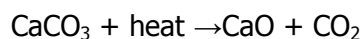
# **LIME KILN**

## **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 CO<sub>2</sub> is 1 atmosphere), but a temperature around 1000 °C (1800 °F; at which temperature the partial pressure of CO<sub>2</sub> 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. INDUSTRY LOOK OUT AND TRENDS**

The current source of supply of lime to the domestic market are Dire Dawa Cement and Lime Factory, Ethio Lime Factory of Senkele, the Caustic Soda lime unit and the Wonji Shoa Sugar Estates supplemented with small quantity of imports. The Caustic Soda and the Showa Sugar Estates lime factories mainly produce for their own use, while the remaining two are primarily producing for the market. Dire Dawa Cement and Lime Factory mainly concentrate on production of cement and allocate only part of its capacity for production of lime. In addition to the above, the Ethiopian Educational Materials Production and Distribution Enterprise (EMPEDA) using its chalk production unit, produces small quantity of masonry lime for the market. As the major function of this unit is chalk production, only small proportion is allocated to masonry lime production. There are small producers of lime in a traditional method scattered all over the country and such producers are also available around Negele. The contribution of traditional suppliers to the local market is quite small and the major source of supply is those factories which use the modern firing system.

### **5. 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.

## **6. RAW MATERIAL REQUIREMENTS:**

Limestone is a sedimentary rock, made up mostly of the mineral calcite, a form of calcium carbonate,  $\text{CaCO}_3$ . 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  $\text{CaCO}_3$  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.

## **7. 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 collects 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 CO<sub>2</sub>. The decomposed limestone is 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.

## 8. 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
	<b>Total</b>		137000.00	14	14	14	17	17

## 9. 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

**10. 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	Working Capital	50.00
	<b>Total</b>	<b>86.63</b>

**11. 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
	<b>Total</b>	<b>86.63</b>

**12. 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
	<b>Total</b>	50.00		23.00	27.00

### 13. 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)
	<b>Plant &amp; Machinery / equipments</b>				
<b>a)</b>	<b>Main Machinery</b>				
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>b)</b>	<b>Ancilliary machinery</b>				
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 &amp; Machinery</i>				<b>16.50</b>
	<b>Furniture / Electrical installations</b>				
a)	Office furniture	LS	1	50000	0.50
b)	Stores Almirah	LS	1	30,000	0.30
c)	Computer & Printer		L. S.	85000	0.85
	<i>sub total</i>				<b>1.65</b>
	<b>Other Assets</b>				
a)	preliminary and preoperative				1.98
	<i>sub-total Other Assets</i>				1.98
	<b>Total</b>				<b>1.98</b>

All the machines and equipment are available from local manufacturers. The entrepreneur needs to ensure proper selection of product mix and proper type of machines and tooling to have modern and flexible designs. It may be worthwhile to look at reconditioned imported

machines, dies and tooling. Some of the machinery and dies and tooling suppliers are listed here below:

- Kamdhenu Agro Machinery  
Plot No. 6, Near Power House,  
Wathoda Road, Wathoda  
Nagpur - 440035  
Maharashtra, India
  
- Future Industries Private Limited  
Shed No. 15, Ambica Estate,  
Corporation Municipal Plot,  
Opposite Sadvichar Hospital,  
Naroda, Ahmedabad - 382330,  
Gujarat, India
  
- The Global Pharma Equipments  
Star Industrial Estate,  
D-32, Naik Pada,  
Near Hanuman Mandir,  
Opposite Dwarka Industrial Estate,  
Vasai East, Vasai - 401208,  
Maharashtra, India



#### 14. 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	<b>Net Profit before tax</b>	₹. In Lacs	<b>-5.61</b>	<b>0.27</b>	<b>7.19</b>	<b>12.63</b>	<b>16.46</b>

The basis of profitability calculation:

The growth of selling capacity will be increased 10% per year. (This is assumed by various analysis and study; it can be increased according to the selling strategy.)

Energy Costs are considered at Rs 7 per Kwh and fuel cost is considered at Rs. 65 per litre. The depreciation of plant is taken at 10-12 % and Interest costs are taken at 14 -15 % depending on type of industry.

#### 15. 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%

## **16. STATUTORY / GOVERNMENT APPROVALS**

As per the allocation of business rules under the Constitution, labour is in the concurrent list of subjects. It is dealt with by the MOLE at the Central and Departments of Labour under State Governments in respective States / UTs. The MOLE has enacted workplace safety and health statutes concerning workers in the manufacturing sector, mines, ports and docks and in construction sectors.

Further, other Ministries of the Government of India have also enacted certain statutes relating to safety aspects of substances, equipment, operations etc. Some of the statutes applicable in the manufacturing sector are discussed below:

### **The Static and Mobile Pressure Vessels (Unfired) Rules, 1981**

These (SMPV) Rules are notified under the Explosives Act, 1884. These rules regulate storage, handling and transport of compressed gases. These rules stipulate requirements regarding construction and fitments, periodic testing, location, fire protection, loading and unloading facilities, transfer operations etc. in respect of pressure vessels whose water capacity exceeds one thousand litres. These rules are enforced by the Chief Controller of Explosives under the Ministry of Industry and Commerce, Govt. of India (PESO).

### **The Manufacture, Storage and Import of Hazardous Chemicals Rules (MSIHC), 1989**

These MSIHC Rules are notified under the Environment (Protection) Act, 1986. These rules are aimed at regulating and handling of certain specified hazardous chemicals. The rules stipulate requirements regarding notification of site, identification of major hazards, taking necessary steps to control major accident, notification of major accident, preparation of safety report and on-site emergency plan; prevention and control of major accident, dissemination of information etc. These rules are notified by the Ministry of Environment and

Forests (MOEF) but enforced by the Inspectorates of Factories of respective States / UTs in the manufacturing sector.

### **The Factories Act, 1948 and State Factories Rules**

The Factories Act, 1948 is very comprehensive legislation dealing with the matters of safety, health and welfare of workers in factories. The Act places duties on the occupier to ensure safety, health and welfare of workers at work. Some of the salient provisions of the Act include:

- Guarding of machinery
- Hoists and Lifts; Lifting Machines and Appliances
- Revolving Machinery
- Pressure Plant
- Excessive Weight
- Protection of Eyes
- Precautions against dangerous fumes, gases etc.
- Explosive or inflammable dust, gas etc.
- Precautions in case of fire
- Safety of buildings and machinery
- Permissible limits of exposure of chemical and toxic substances
- Entrepreneur may contact State Pollution Control Board where ever it is applicable.

## **17. BACKWARD AND FORWARD INTEGRATIONS**

Chemical companies often become integrated and undergo other activities outside the chemical industry. Increased competition prompts many companies to reduce supply chain costs by looking outside the chemical sector at suppliers and customers. While most companies within the chemicals sector primarily produce chemicals, some companies also conduct other manufacturing activities. The exact proportion of chemicals sector companies that are integrated with other sector activities is unknown, but many companies actively seek

vertical integration. Many manufacturers pursue vertical integration to secure suppliers and customers for their products.

Mergers and acquisitions are a common way for companies to undertake new chemical ventures. By purchasing their chemical suppliers, some manufacturers secure future chemical feedstock for their products or other chemicals that they use in manufacturing. The company making the purchase obtains valuable expertise and equipment. Some mining and petrochemical production is more cost-effective when integrated within a chemical company. Energy and feedstock costs are often a significant expense for chemical companies. Integrating chemical production with activities that secure supplies of chemical feedstock and energy is relatively common as chemical companies grow. Chemical companies are located near mines, oil fields, ammonia factories and water supplies. This reduces transportation costs and increases the reliability of supplies by reducing the distance between feedstock and the factory.

Some companies, such as Sino-Coking Coal and Coke Chemical Industries Incorporated, own their mines. BHP Billiton operates a broad range of mines and is primarily a mining company. It does, however, also produce petrochemical feedstock for the chemical industry and therefore operates within the chemical industry as well. These companies technically operate within both the chemical and mining industries in their normal business operations.

Integrating a chemical company with other activities provides several direct benefits for the company and is becoming increasingly common. High energy costs necessitate greater control of energy resources and minimal reliance on expensive transportation. Chemical companies experience volatile profitability due to fluctuations in feedstock and energy expenses. Some companies control this volatility through careful supply chain management and by charging supply surcharges. Actively researching and developing alternative feedstock and energy supplies helps the company reduce costs.

Vertical integration supports these activities by eliminating redundant activities at multiple companies and increasing efficiency. By consolidating activity among multiple, similar operations, chemical companies achieve cost savings that contribute to higher profitability.

End products are often very profitable, and some chemical companies purchase their former customers to take advantage of the marked-up prices of products further along in the supply chain.

Integration may become more common for many chemical companies as competition strengthens and traditional feedstock becomes more expensive. Market demand for chemical feedstock increases as emerging market economies grow and result in increased consumer spending around the world.

## **18. TRAINING CENTERS AND COURSES**

There is no such training required to start this business but, basic chemical bachelor's degree is plus point for enterpriser. Promoter may train their employees in such specialized institutions to grow up the business. There are few specialised Institutes provide degree certification in chemical Technology, few most famous and authenticate Institutions are as follows:

1. Department of chemical LD college of engineering  
No.120, Circular Road, University Area, Navrangpura,  
Opposite Gujarat University, Ahmedabad, Gujarat 380015
  
2. MIT College of chemicalEngineering, **Pune**  
Gate.No.140, Raj Baugh Educational Complex,  
Pune Solapur Highway,  
Loni Kalbhor, Pune – 412201  
Maharashtra, India

Udyamimitraportal ( link : [www.udyamimitra.in](http://www.udyamimitra.in) ) can also be accessed for handholding services viz. application filling / project report preparation, EDP, financial Training, Skill Development, mentoring etc.

Entrepreneurship program helps to run business successfully is also available from Institutes like Entrepreneurship Development Institute of India (EDII) and its affiliates all over India.

**Disclaimer:**

Only few machine manufacturers are mentioned in the profile, although many machine manufacturers are available in the market. The addresses given for machinery manufacturers have been taken from reliable sources, to the best of knowledge and contacts. However, no responsibility is admitted, in case any inadvertent error or incorrectness is noticed therein. Further the same have been given by way of information only and do not carry any recommendation.