76. PROFILE ON HYDRATED LIME

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I.   SUMMARY

This profile envisages the establishment of a plant for the production of 5,000 tonnes of hydrated lime per annum.

The present demand for the proposed product is estimated at 12,000 tonnes and it is projected to reach at 35,951 tonnes by the year 2014.

The plant will create employment opportunities for 28 persons.

The total investment requirement is estimated at Birr 13.28 million, out of which Birr 10 million is required for plant and machinery.

The project is financially viable with an internal rate of return (IRR) of 16% and a net present value (NPV) of Birr 4.57 million, discounted at 10.5%.

II.   PRODUCT DESCRIPTION AND APPLICATION

Hydrated lime is a dry powder obtained by treating quick lime with water enough to satisfy its chemical affinity for water under the conditions of hydration. It consists essentially of calcium hydroxide and some magnesium hydroxide.   Certainly, it is less perishable chemically since water doesn't alter its chemical composition.

Hydrated lime is used in mortar, plasters, cement-lime paints, medicines and in agriculture to sweeten the acid soil. It is also used in curing of leather, in paper and pulp industry.   Hydrated lime finds its application in metallurgy as flux, in specialized lubricants as a bonding agent, as a filler in refractory.

III.   MARKET STUDY AND PLANT CAPACITY

A.   MARKET STUDY

1.   Past Supply and Present Demand

The major source of supply for lime is domestic production supplemented with small quantity of imports. Imports of lime in the past 10 years was on the average about 20 tonnes per annum.

The two factories that supply lime to the domestic market are Dire Dawa Cement Factory and Ethio-Lime Factory of Senkele. Lime is also produced by Wonji Shoa Sugar Factory and Caustic Soda Plant of Ziway entirely for their own consumption. There are also small producers in most parts of the country. However, the contribution of traditional suppliers to the local market is quite small.

Information obtained from Statistical Abstract of CSA with regard to the domestic production of lime for the period covering 1995/96-2001/02 is given in Table3.1

Table 3.1
DOMESTIC PRODUCTION OF LIME IN TONNES

Year	Domestic Production	% Change
1995/96	7207	-
1996/97	7332	1.73
1997/98	6619	(14.39)
1998/99	6813	2.93
1999/00	9273	36.11
2000/01	11,350	22.40
2001/02	7,805	(31.23)
Total	**56,399**	**17.55**
Average	**8,057**	**2.93**

Source:- CSA , statistical Abstracts of Various Years.

As can be seen from Table 3.1, the average local production in the period under review is 8,057 tonnes while import stands at about 20 tonnes. However, it has to be

noted that the data obtained from CSA may refer only to these factories that supply lime to the market which does not include production by Wonji Shoa Sugar Factory and Ziway Caustic Soda Plant that is entirely used for their own. The production of these two plants is estimated to reach about 5, 000 tonnes. This brings annual domestic supply to 13,057 tonnes.

The present major users of lime are the building construction sector, tanneries, sugar industries, chemical factories, water & sewerage treatment plants, etc. In addition, lime can be used in the agricultural sector as neutralizing agent in irrigated agriculture where soil is affected by acidity.

Due to limited size of supply and old age of the existing suppliers (Senkele and Dire Dawa) the adequacy and stability of current supply is questionable Ted. Due to lack of adequate and consistent supply many users are forced to wait for a long time to fulfill their requirements. According to previous IPS study of the construction sector, the water treatment plant, the tanneries, the gold mines and other users of lime(excluding those that produce for their own) have a combined effective demand of 12,000 tonnes at current level of production. This indicates that there is shortage by about 4,000 tonnes.

2.   Projected Demand

Demand for lime is believed to grow parallel with the development of the user industries such as the construction sector, water and sewerage treatment plants, chemical industries, tanneries, sugar factors, metallurgical industries as well as the agricultural sector and the like. By considering the combined effect of the various influencing factors demand for lime in the country is conservatively assumed to grow at an annual average rate of 12%.

By applying a 12 % growth rate on the current effective demand, the projected demand up to the year 2014 is shown in Table 3.2.

Table 3.2

PROJECTED DEMAND AND SUPPLY GAP OF LIME (TONNES)

Year	Existing Supply	Projected Demand	Supply Gap (Shortage)
2004	8057	12,000	3,943
2005	8057	13,440	5,383
2006	8057	15,053	6,996
2007	8057	16,859	8,802
2008	8057	18,882	6,175
2009	8057	20,770	12,713
2010	8057	22,848	14,791
2011	8057	25,589	17,532
2012	8057	28,660	20,603
2013	8057	32,099	24,042
2014	8057	35,951	27,894

3.   Pricing and distribution

The current price of lime ranges from about Birr 1000 per tonne to Birr 1250 per tonne. It is proposed that the envisaged plant will sell its product at Birr 1100 per tonne.

The product can be distributed directly to major users or it can be sold by making use of agents.

B.   PLANT CAPACITY AND PRODUCTION PROGRAMME

1.   Plant Capacity

Based on the market study and minimum economic scale for lime production, the envisaged plant is proposed to have an annual capacity of 5,000 tonnes.

2.   Production Programme

Considering the time required for market penetration and skill development, the plant is assumed to operate at 70%, 85% & 95% of full capacity in the first, second and third year respectively.   The plant will operate at full capacity in the fourth year and thenafter.   It will operate 300 days in a year in three shift production system, since it is energy intensive production process.

IV.   MATERIAL AND INPUTS

A.   RAW AND AUXILIARY MATERIALS

The principal raw material for the production of lime is limestone. This raw material is a sedimentary rock dominantly composed of carbonate minerals, particularly carbonates of calcium and magnesium.   The region is rich in this resource.   The annual requirement of this raw material and its cost is depicted in Table 4.1.

<u>**Table 4.1**</u>
<u>**ANNUAL RAW AND AUXILIARY MATERIALS**</u>
<u>**REQUIREMENT AND COST**</u>

Sr. No.	Description	Qty	Cost '000 Birr
1	Royality (3% of gross sales)	-	187.5
2	Packing material	200,000 pcs	500.0
	Grand Total		**687.5**

B.   UTILITIES

The utilities required are fuel oil for calcinations of calcium carbonate, electric power for motor driving and water for hydration of lime as well as for general purpose.   The annual requirement of these utilities is indicated in Table 4.2.

Table 4.2

ANNUAL REQUIREMENT OF UTILITIES AND COST

Sr. No.	Description	Qty	Cost '000 Birr
1.	Fuel oil/ mazut (m^3)	802	1,604
2.	Electricity (MWH)	250	109.5
3.	Water (m^3)	4000	6.0
	Grand Total		**1,719.5**

V. TECHNOLOGY AND ENGINEERING

A. TECHNOLOGY

1. Process Description

Quick lime is produced by calcinating calcium carbonate obtained by blasting the face of calcium carbonate quarry. Although most lime is sold as a quick lime, production of hydrated lime is also substantial. Small lime consumers cannot economically justify the additional processing step that hydration entails.

The manufacture of hydrated lime proceeds by the slow addition of water to crushed or ground quick lime in a pre-mixing chamber or a vessel known as a hydrator, both of which mix and agitate the lime and water. The amount of water added is critical. Too much water makes it impossible (or too costly) to produce the desired dry form, too little water leaves hydration incomplete causing degraded quality, namely, chemical instability and structural unsoundness. The hydrated lime is finally pulverized and packed.

2.   Source of Technology

The machinery and equipment required for the production of lime can be obtained from the following foreign suppliers.

MOVERS (INDIA) PRIVATE LTD

BASAVA BHAMAN, HIGH GROUNDS

FAX 91-802263606

The above mentioned company is a leading Indian company in the manufacture of cement, lime and mineral product producing machinery.

B.   ENGINEERING

1.   Machinery and Equipment

One of the core machine in lime production is the kiln. Others such as crusher; elevator, belt conveyor, dust separators & hydrator are also useful by preparing transporting and hydrating the quick lime produced in the kiln.   The total cost of machinery and equipment is estimated at about Birr 10 million, out of which Birr 7 million is required in foreign currency.   Lists of required machinery and equipment is shown in Table 5.1.

Table 5.1
LIST OF MACHINERY AND EQUIPMENT

Sr. No.	Description	Quantity
1.	Rotary kiln	1
2.	Rotary cooler	1
3.	Jaw crusher	2
4.	Belt coveyor	1
5.	Elevator	2
6.	Pump & storage tank	3
7.	Fan	2
8.	Mist eliminator	1
9.	Venturi	1
10.	Grinder (Ball mill)	1
11.	Hydrator	1
12.	Filling machine	1

2.   Land, Building and Civil Works

The envisaged plant requires an estimated area of 2,000 m^2, of which 800 m^2 is built-up area.   The construction cost of building at a rate of Birr 800 per m^2 is estimated at Birr 800,000.   Lease value of land at a rate of Birr 1.2 per m^2 for 70 years is estimated to be Birr 168,000.   Thus, the total investment cost for land, building ad civil works assuming that the total land lease cost will be paid in advance is estimated at 968,000.

3.   Proposed Location

The plant should be located near the calcium carbonate deposit inorder to avoid transportation cost of bulky raw material.   Infrastructure like road, electricity, water, etc are also necessary for the smooth operation of the plant.   Therefore, the appropriate location of the plant is in Metekel zone.

VI.   MANPOWER AND TRAINING REQUIREMENT

A.   MANPOWER REQUIREMENT

Manpower required to operate the plant is 28 persons.   The detailed list of manpower & labour is shown in Table 6.1.

Table 6.1

MANPOWER REQUIREMENT AND LABOUR COST (IN BIRR)

Sr. No.	Description	Req. No.	Salary Monthly	Salary Annually
1	General manger	1	1500	18,000
2	Secretary	1	500	6,000
3	Accountant	1	700	8,400
4	Personnel	1	700	8,400
5	Store keeper	1	500	6,000
6	Production &Tech. head	1	1200	14,400
7	Mechanic/Electrician	2	350	8,400
8	Operators	5	200	12,000
9	Un skilled workers	5	150	9,000
10	Sales man/purchaser	1	1200	14,400
11	Cashier	1	500	6,000
12	Guard	6	200	3,600
13	Driver	2	500	6,000
	Sub-Total	**28**		**114,600**
	Benefits 25% of sub total			28,650
	Grand Total	**28**		**143,250**

B. TRAINING REQUIREMENT

Training of key personnel's such as production and technic head, supervisors, technicians, mechanics and operators is essential. This can be done both by the experts of machinery suppliers during commissioning and sending to the factories that are producing the same product like Mugher Cement Factory. The cost of training is estimated to be Birr 100,000.

VII. FINANCIAL ANALYSIS

The financial analysis of hydrated lime project is based on the data provided in the previous chapters and the following assumptions:-

Construction period	2 years
Source of finance	30% equity
	70% loan
Tax holidays	3 years
Bank interest	10.5%
Discounted cash flow	10.5%
Repair and maintenance	5% of Plant machinery and equipment
Accounts receivable	30 days
Raw material (local)	60 days
Work in progress	3 days
Finished products	30 days
Cash at hand	5 days
Accounts payable	30 days

A. TOTAL INITIAL INVESTMENT COST

The total initial investment cost of the project including working capital is estimated at Birr 13.28 million, out of which about 53% will be required in foreign currency. Details are indicated in Table 7.1.

Table 7.1

INITIAL INVESTMENT COST ('000 BIRR)

Sr. No.	Cost Items	Foreign Currency	Local Currency	Total
1	Land	-	168.00	168.00
2	Building and Civil Work	-	800.00	800.00
3	Plant Machinery and Equipment	7,000.00	3,000.00	10,000.00
4	Office Furniture and Equipment	-	50.00	50.00
5	Vehicle	-	175.00	175.00
6	Pre-production Expenditure*	-	1,847.22	1,847.22
	Total Investment Cost	**7,000.00**	**6,040.22**	**13,040.22**
7	Working Capital	-	245.91	245.91
	Grand Total	**7,000.00**	**6,286.14**	**13,286.14**

B.   PRODUCTION COST

The annual production cost at full operation capacity of the plant is estimated at Birr 4.03 million (see Table 7.2). The royalty, material and utility cost accounts for 60 per cent while repair and maintenance take 3.72 per cent of the production cost.

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* *Pre-production expenditure include interest during construction (Birr 1.75 million) training (Birr 100,000) cost of registration, licensing and formation of the company including legal fees, commissioning expenses, etc.*

Table 7.2

ANNUAL PRODUCTION COST

('000 BIRR)

Items	Year			
	3	4	7	10
Royalty, raw Material and Inputs	481.25	584.32	687.50	687.50
Labour Direct	48.13	58.44	68.76	68.76
Utilities	1,203.65	1,461.43	1,719.66	1,719.66
Maintenance and repair	105.00	127.49	150.00	150.00
Labour overheads	20.05	24.35	28.65	28.65
Administration Cost	32.08	38.96	45.84	45.84
Total operating costs	**1,890.18**	**2,256.03**	**2,700.5**	**2,700.5**
Depreciation	602.40	602.40	602.40	547.40
Cost of Finance	1,013.49	951.41	723.24	415.38
Total Production Cost	**3,506.07**	**3,848.80**	**4,026.13**	**3,663.03**

C.   FINANCIAL EVALUATION

1.   Profitability

According to the projected income statement, the project will start generating profit in the first year of operation. Important ratios such as the percentage of net profit to total sales, net profit to equity (return on equity) and net profit plus interest to total investment (return on total investment) will show an increasing trend throughout the production life of the project.

The income statement and other profitability indicators show that the project is viable.

2.   **Break-even Analysis**

The break-even point of the project is estimated by using income statement projection.

$$BE = \frac{\text{Fixed Cost}}{\text{Sales-Variable Cost}} = 14\ \%$$

3.   **Pay-Back Period**

The investment cost and income statement projection are used to project the pay-back period, the project will fully recover the initial investment and working capital within 6 years time.

4.   **Internal Rate of Return and Net Present Value**

Based on the cash flow statement, the calculated IRR of the project is 16 % and the net present value at 10.5% discount rate is Birr 4.57 million.

D.   **ECONOMIC BENEFITS**

The project can create employment opportunities for 28 persons.   In addition to supply of the domestic needs, the project will generate Birr 7.02 million in terms of tax revenue. Moreover, the Regional Government can collect employment, income tax and sales tax revenue.