PROFILE ON THE PRODUCTION OF CALCIUM SILICATE

TABLE OF CONTENTS

I. SUMMARY

This profile envisages the establishment of a plant for the production of calcium silicate with a capacity of 69 tonnes per annum. Calcium silicate is used in the rubber, paint, paper, insecticide, plastics and insulation materials production.

Raw materials required to produce calcium silicate are lime, hydrochloric acid and sodium silicate. Except lime the other raw materials have to be imported.

The present demand for the proposed product is estimated at 57 tonnes per annum. The demand is expected to reach at 147.8 tonnes by the year 2018.

The plant will create employment opportunities for 18 persons.

The total investment requirement is estimated at about Birr 4.64 million, out of which Birr 728 thousand is required for machinery and treatment basin.

The project is financially viable with an internal rate of return (IRR) of 12.76 % and a net present value (NPV) of Birr 1.10 million, discounted at 8.5%.

The plant creates both backward and forward linkage with the mining and chemical industry respectively. The establishment of such factory will have a foreign exchange saving effect to the country by substituting the current imports.

II. PRODUCT DESCRIPTION AND APPLICATION

Calcium silicate is the chemical compound Ca2SiO4, also known as calcium orthisilicate. It is a white poeder with a low bulk density and high physical water absorption. Calcium silicates are available in different grades having varied physical properties to suit specific application.

They are used as an insecticide carrier, roads, roof tiles, bricks, anti caking agent and for insulation of steam lines, ovens and furnaces.

III. MARKET STUDY AND PLANT CAPACITY

A. MARKET STUDY

1. Past Supply and Present Demand

As there is no domestic production of calcium silicate, the apparent consumption, which is considered to be a fair approximation of the present demand, is entirely constituted by import. Data obtained from the Ethiopian Customs Authority with regard to import of calcium silicate for the period covering 2001-2006 is given in Table 3.1.

Table 3.1

IMPORT OF CALCIUM SILICATE (1997-2006)

Year	Import (Tonnes)
2001	251.7
2002	11.8
2003	13.2
2004	26.0
2005	11.7
2006	29.6

Source: - *Customs Authority, External Trade Statistics.*

As can be seen from Table 3.1, the import figures are highly erratic. In 2001 the import figure was about 251.7 tonnes while in the following years, i.e., 2002 and 2003 the import figure dropped to 11.8 tonnes and 13.2 tonnes respectively. Similarly, import figure in the

year 2004 was about 26 tonnes while in the following consecutive years, i.e., during 2005 and 2006 import was 11.7 tonnes and 29.6 tonnes, respectively.

This very high fluctuation probably indicates that the high import in some years was used as buffer stocks for the following years. Hence, some portion of the imports was distributed among the subsequent years in which recorded import figures were found to be comparatively low.

Therefore, since the supply i.e. apparent consumption of the product is characterized by year to year fluctuation with out a clear trend the average quantity supplied during the past six years is assumed to approximate the current demand for the product. Accordingly, current effective demand is estimated at 57 tonnes.

2. Projected Demand

The future demand for calcium silicate is a function of growth of the end-user industries. The market oriented economic policy is expected to hasten the rate of investment in different economic sectors of the country including the manufacturing sector. Taking the expected favorable conditions in the future an annual growth rate of 10% is considered for projecting the demand for the product. The projected demand is presented in Table 3.2.

Table 3.2

PROJECTED DEMAND FOR CALCIUM SILICATE (TONNES)

Year	Projected Demand
2009	62.7
2010	69.0
2011	75.9
2012	83.5
2013	91.8
2014	101.0
2015	111.1
2016	122.2
2017	134.4
2018	147.8

Demand for the product will grow from 62.7 tonnes during 2009 to 91.8 tonnes and 147.8 tonnes by the year 2013 and 2018, respectively.

3. Pricing and Distribution

Based on current market price of the product and assuming margins for distributors, a factory-gate price of Birr 15 per kg is recommended for the envisaged plant. The product can be directly supplied to end-user industries.

B. PLANT CAPACITY AND PRODUCTION PROGRAMME

1. Plant Capacity

The market study has shown that the product is totally imported. Based on the market study, the envisaged plant capacity will be 230 kg/day and considering 300 working days per annum the annual production capacity will be 69 tonnes.

2. Production Programme

The plant operates at 85 % of its capacity in the first year, and grows to 95 % and 100% of its rated capacity in the second year and the third year and then after, respectively.

Table 3.3

PRODUCTION PROGRAMME

Sr. No.	Product	Production Year		
		1	2	3-10
1	Calcium Silicate (tonnes)	59	66	69
2	Capacity utilization (%)	85	95	100

IV. MATERIAL AND INPUTS

A. RAW MATERIALS

The main raw materials used for manufacturing calcium silicate are lime, hydrochloric acid and sodium silicate. All the raw materials are locally available; lime from Mugher or Zeway Caustic Soda S.Co and calcium silicate from soap producing companies like ZAK. The annual requirement of these raw materials and their respective cost is given in Table 4.1.

Table 4.1

ANNUAL RAW MATERIALS REQUIREMENT AND COST

Sr. No.	Item	Qty. (Tonnes)	Cost(Birr)		
			LC	FC	TC
1	Lime	64	56,000	-	56,000
2	Hydrochloric acid	24	43,800	131,400	175,200
3	Sodium silicate	12	45,600	-	45600
	Grand Total		**145,400**	**131,400**	**276,800**

B. UTILITIES

Utilities required for manufacturing calcium silicate includes water, electricity and steam The quantity required and cost is given in Table 4.2.

Table 4.2

ANNUAL UTILITIES REQUIREMENT AND COST

Sr. No.	Item	Annual Consumption	Unit of Measure	Cost (Birr)
1	Water	450	m^3	1,462.5
2	Electricity	171,600	kWh	81,270
3	Fuel	6,863	Liters	40,080
	Total			**122,812.5**

V. TECHNOLOGY AND ENGINEERING

A. TECHNOLOGY

1. Process Description

Burnt lime is treated with hydrochloric acid to produce calcium chloride. The addition of acid should be so calculated and adjusted that almost a neutral solution is obtained. The clear solution of calcium chloride is decanted from the top. A portion of calcium chloride is taken in evaporators and crystallized in suitable crystallizers. The remaining part of calcium chloride solution is then treated with a clear sodium silicate, when calcium silicate is precipitated out. The precipitate is centrifuged, washed, dried and packed in suitable containers.

The washed out solution of Calcium silicate production can cause to contaminate surface and ground waters, and land. To make the manufacturing process environment friendly it is necessary to have a waste disposal and treatment basin. The cost of treatment basin is estimated at Birr 75,000.

2. Source of Technology

Machinery supplier address is shown bwlow.

Ome Sea Interlink private limited
A-48, Krishnangar, Opp. Adinathnagar Odhav
Ahmedrabad Gujrat- 382 415 (India)

B. ENGINEERING

The equipments and machineries, which will be used, are for mixing, precipitating, evaporating, centrifuging, filtering and drying of the intermediate and final product.

1. Machinery and Equipments

The list of machineries and equipments required by the envisaged plant are shown in Table 5.1.

Table 5.1

MACHINERY AND EQUIPMENT REQUIREMENT AND COST

Sr. No.	Description	Qty	Cost in '000 Birr		
			LC	FC	TC
1	Mixing tank (Rubber lined)	4	93.18	-	93.18
2	Mixing tank (Mild steel)	1	78.62	-	78.62
3	Storage tank	1	69.88	-	69.89
4	Dilution tank	1	49.50	-	49.50
5	Mini boiler	1	-	174.72	174.72
6	Electrical drying oven	2	-	152.88	152.88
7	Filter press	1	-	109.20	109.20
Grand Total			**291.2**	**436.80**	**728.0**

The total cost of machineries and equipment is estimated to be Birr 728,000, out of which Birr 436,800 is required in foreign currency.

2. Land, Building And Civil Works

The total land requirement for the envisaged plant is estimated at 1,000 m^2, out of this 350 m^2 is built-up area. 190 m^2 will be used for production facility, 90m^2 for store and 70m^2

for office purpose. The Cost of building construction at rate of birr 2,400 per m^2 amounts to Birr 840,000.

According to the Federal Legislation on the Lease Holding of Urban Land (Proclamation No 272/2002) in principle, urban land permit by lease is on auction or negotiation basis, however, the time and condition of applying the proclamation shall be determined by the concerned regional or city government depending on the level of development.

The legislation has also set the maximum on lease period and the payment of lease prices. The lease period ranges from 99 years for education, cultural research health, sport, NGO , religious and residential area to 80 years for industry and 70 years for trade while the lease payment period ranges from 10 years to 60 years based on the towns grade and type of investment.

Moreover, advance payment of lease based on the type of investment ranges from 5% to 10%.The lease price is payable after the grace period annually. For those that pay the entire amount of the lease will receive 0.5% discount from the total lease value and those that pay in installments will be charged interest based on the prevailing interest rate of banks. Moreover, based on the type of investment, two to seven years grace period shall also be provided.

However, the Federal Legislation on the Lease Holding of Urban Land apart from setting the maximum has conferred on regional and city governments the power to issue regulations on the exact terms based on the development level of each region.

In Addis Ababa the City's Land Administration and Development Authority is directly responsible in dealing with matters concerning land. However, regarding the manufacturing sector, industrial zone preparation is one of the strategic intervention measures adopted by the City Administration for the promotion of the sector and all manufacturing projects are assumed to be located in the developed industrial zones.

Regarding land allocation of industrial zones if the land requirement of the project is blow 5000 m^2 the land lease request is evaluated and decided upon by the Industrial Zone Development and Coordination Committee of the City's Investment Authority. However, if the land request is above 5,000 m^2 the request is evaluated by the City's Investment Authority and passed with recommendation to the Land Development and Administration Authority for decision, while the lease price is the same for both cases.

The land lease price in the industrial zones varies from one place to the other. For example, a land was allocated with a lease price of Birr 284 /m^2 in Akakai-Kalti and Birr 341/ m^2 in Lebu and recently the city's Investment Agency has proposed a lease price of Birr 346 per m^2 for all industrial zones.

Accordingly, in order to estimate the land lease cost of the project profiles it is assumed that all manufacturing projects will be located in the industrial zones. Therefore, for this profile, which is a manufacturing project a land lease rate of Birr 346 per m^2 is adopted.

On the other hand, some of the investment incentives arranged by the Addis Ababa City Administration on lease payment for industrial projects are granting longer grace period and extending the lease payment period. The criterions are creation of job opportunity, foreign exchange saving, investment capital and land utilization tendency etc. Accordingly, Table 5.2 shows incentives for lease payment.

Table 5.2

INCENTIVES FOR LEASE PAYMENT OF INDUSTRIAL PROJECTS

Scored Point	Grace Period	Payment Completion Period	Down Payment
Above 75%	5 Years	30 Years	10%
From 50 - 75%	5 Years	28 Years	10%
From 25 - 49%	4 Years	25 Years	10%

For the purpose of this project profile the average, i.e., five years grace period, 28 years payment completion period and 10% down payment is used. The period of lease for industry is 60 years.

Accordingly, the total lease cost, for a period of 60 years with cost of Birr 346 per m^2, is estimated at Birr 20.76 million of which 10% or Birr 2,076,000 will be paid in advance. The remaining Birr 18.68 million will be paid in equal installments with in 28 years, i.e., Birr 667,286 annually.

VI. MANPOWER AND TRAINING REQUIREMENT

A. MANPOWER REQUIREMENT

In order to run the envisaged plant efficiently, it needs 20 employees. The estimated annual cost of manpower is Birr 203,250. The detail of which is shown in Table 6.1.

Table 6.1

MANPOWER REQUIREMENT AND ESTIMATED ANNUAL COST

Sr. No.	Description	Req. No.	Monthly salary (Birr)	Annual Salary (Birr)
1	Manager	1	3000	36,000
2	Secretary	1	800	9,600
3	Administration +Finance Head	1	2500	30,000
4	Chemist	2	1800	21,600
5	Electrician	1	700	8,400
6	Mechanic	1	700	8,400
7	Operators	2	1200	14,400
8	Laborers	4	1400	16,800
9	Drivers	1	400	4,800
10	Guards	3	1050	12,600
	Sub-Total	**18**		**162,600**
Employee's benefit (25%)				40,650
Grand Total				**203,250**

B. TRAINING REQUIREMENT

The training of operators, mechanics and electricians would be essential. It has to be arranged during the erection and commissioning period by machinery suppliers without additional cost.

VII. FINANCIAL ANALYSIS

The financial analysis of the calcium silicate project is based on the data presented in the previous chapters and the following assumptions:-

Construction period	1 year
Source of finance	30 % equity
	70 % loan
Tax holidays	2 years
Bank interest	8.5%
Discount cash flow	8.5%
Accounts receivable	30 days
Raw material local	30 days
Raw Material import	90 days
Finished products	30 days
Cash in hand	5 days
Accounts payable	30 days
Repair and maintenance	5% of machinery cost

A. TOTAL INITIAL INVESTMENT COST

The total investment cost of the project including working capital is estimated at Birr 4.64 million, of which 9 per cent will be required in foreign currency.

The major breakdown of the total initial investment cost is shown in Table 7.1.

Table 7.1

INITIAL INVESTMENT COST (' 000 Birr)

Sr. No.	Cost Items	Local Cost	Foreign Cost	Total Cost
1	Land lease value	2,076.00	-	2,076.00
2	Building and Civil Work	840.00	-	840.00
3	Plant Machinery and Equipment	291.2	436.80	728.00
4	Office Furniture and Equipment	100.00	-	100.00
5	Vehicle	450.00	-	450.00
6	Pre-production Expenditure*	413.64	-	413.64
7	Working Capital	36.49	-	36.49
	Total Investment cost	**4,207.33**	**436.80**	**4,644.13**

** N.B Pre-production expenditure includes interest during construction (Birr 313.64 thousand) and Birr 100 thousand costs of registration, licensing and formation of the company including legal fees, commissioning expenses, etc.*

B. PRODUCTION COST

The annual production cost at full operation capacity is estimated at Birr 1.05 million (see Table 7.2). The raw material cost accounts for 26.34 per cent of the production cost. The other major components of the production cost are financial cost , depreciation , and utility which account for 20.02 %, 19.14% and 11.69 % respectively. The remaining 22.81 % is the share of direct labour, repair and maintenance and other administration cost.

Table 7.2

ANNUAL PRODUCTION COST AT FULL CAPACITY ('000 BIRR)

Items	Cost	%
Raw Material and Inputs	276.80	26.34
Utilities	122.81	11.69
Maintenance and repair	36.40	3.46
Labour direct	97.56	9.29
Labour overheads	40.65	3.87
Administration Costs	65.04	6.19
Land lease cost	-	-
Total Operating Costs	**639.26**	60.84
Depreciation	201.12	19.14
Cost of Finance	210.33	20.02
Total Production Cost	**1,050.71**	**100**

C. FINANCIAL EVALUATION

1. Profitability

Based on the projected profit and loss statement, the project will generate a profit through out its operation life. Annual net profit after tax will grow from Birr 111.03 thousand to Birr 461.73 thousand during the life of the project. Moreover, at the end of the project life the accumulated cash flow amounts to Birr 4.44 million.

2. Ratios

In financial analysis financial ratios and efficiency ratios are used as an index or yardstick for evaluating the financial position of a firm. It is also an indicator for the strength and weakness of the firm or a project. Using the year-end balance sheet figures and other relevant data, the most important ratios such as return on sales which is computed by

dividing net income by revenue, return on assets (operating income divided by assets), return on equity (net profit divided by equity) and return on total investment (net profit plus interest divided by total investment) has been carried out over the period of the project life and all the results are found to be satisfactory.

3. Break-even Analysis

The break-even analysis establishes a relationship between operation costs and revenues. It indicates the level at which costs and revenue are in equilibrium. To this end, the break-even point of the project including cost of finance when it starts to operate at full capacity (year 3) is estimated by using income statement projection.

$$BE = \frac{\text{Fixed Cost}}{\text{Sales} - \text{Variable Cost}} = 27\ \%$$

4. Payback Period

The pay back period, also called pay – off period is defined as the period required to recover the original investment outlay through the accumulated net cash flows earned by the project. Accordingly, based on the projected cash flow it is estimated that the project's initial investment will be fully recovered within 7 years.

5. Internal Rate of Return

The internal rate of return (IRR) is the annualized effective compounded return rate that can be earned on the invested capital, i.e., the yield on the investment. Put another way, the internal rate of return for an investment is the discount rate that makes the net present value of the investment's income stream total to zero. It is an indicator of the efficiency or quality of an investment. A project is a good investment proposition if its IRR is greater than the rate of return that could be earned by alternate investments or putting the money

in a bank account. Accordingly, the IRR of this project is computed to be 12.76 % indicating the viability of the project.

6. Net Present Value

Net present value (NPV) is defined as the total present (discounted) value of a time series of cash flows. NPV aggregates cash flows that occur during different periods of time during the life of a project in to a common measuring unit i.e. present value. It is a standard method for using the time value of money to appraise long-term projects. NPV is an indicator of how much value an investment or project adds to the capital invested. In principal a project is accepted if the NPV is non-negative.

Accordingly, the net present value of the project at 8.5% discount rate is found to be Birr 1.10 million which is acceptable.

D. ECONOMIC BENEFITS

The project can create employment for 18 persons. In addition to supply of the domestic needs, the project will generate Birr 1.09 million in terms of tax revenue. The establishment of such factory will have a foreign exchange saving effect to the country by substituting the current imports. The plant creates both backward and forward linkage with the mining and chemical industry, respectively.