209. PROFILE ON PRODUCTION OF CALCIUM SILICATE

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I. SUMMARY

This profile envisages the establishment of a plant for the production of calcium silicate with a capacity of 45 tones per annum.

The present demand for the proposed product is estimated at 55.8 tones per annum. The demand is expected to reach at 232.95 tones by the year 2022.

The plant will create employment opportunities for 15 persons.

The total investment requirement is estimated at about Birr 1.81 million, out of which Birr 390,000 is required for plant and machinery.

The project is financially viable with an internal rate of return (IRR) of 20 % and a net present value (NPV) of Birr 876,720 discounted at 8.5%.

II. PRODUCT DESCRIPTION AND APPLICATION

Calcium Silicate is available in different grades, having varied physical properties to suit specific applications. It is used industries such as rubber, paints, paper, insecticides, self setting moulded insulations and plastics.

One of the grades called liquid absorbent grade has high absorbing power, good fluidity and low bulk density. Its major use is as an insecticide carrier.

The insulation grade, which is self setting under atmospheric pressure, finds use in insulation of steam lines, ovens and furnaces.

III. MARKET STUDY AND PLANT CAPACITY

A. MARKET STUDY

1. Past Supply and Present Demand

Calcium silicate is used in rubber, paint, paper, insecticide, plastic, and insulation materials production. 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 1997-2006 is given in Table 3.1.

Table 3.1

IMPORT OF CALCIUM SILICATE (1997-2006)

Year	Import (Tones)
1997	90.4
1998	0.6
1999	46.5
2000	0.2
2001	251.7
2002	11.8
2003	13.2
2004	126.0
2005	11.7
2006	29.6

Source: *Customs Authority, External Trade Statistics annual issues.*

As can be seen from Table 3.1 there were years in which import figures were unusually high. This situation can be clearly seen in the years 1997, 2001 and 2004 when their respective import figures were much higher than the imports in the following years. In 1997 the import figure was about 90.4 tones while in t he following years i.e. 1998, 1999 and 2000 the import figure dropped to 0.6 tones, 46.5 tones and 0.2 tones respectively. Similarly import figure in the year 2001 was about 251.7 tones while in the following consecutive years i.e. from 2002 and 2003 import was 11.8 tones and 29.6 tones respectively. During 2004 import were 126 tones which again drop to 11.7 and 29.6 tones during 2004 and 2005.

This probably indicates that the high imports in some years were 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 most recent three years is assumed to approximate the current demand for the product. Accordingly current effective demand is estimated at 55.8 tones.

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 SODIUM SILICATE

Year	Projection (Tones)
2008	61.34
2009	67.48
2010	74.23
2011	81.65
2012	89.81
2013	98.79
2014	108.67
2015	119.54
2016	131.49
2017	144.64
2018	159.11
2019	175.02
2020	192.52
2021	211.77
2022	232.95

3. Pricing and Distribution

Based on current market price of the product and assuming margins for distributors a factory gate price of Birr 3500 per tone is recommended for the envisaged plant. The product can be directly supplied to end-users.

B. PLANT CAPACITY AND PRODUCTION PROGRAM

1. Plant Capacity

The plant is envisaged to produce 45 ton/year, in 300 working days and operating 8 hours per day.

2. Production Programme

The production programme is shown in Table 3.3. The production programme is set by considering just 300 working days per annum.

Table 3.3

PRODUCTION PROGRAMME

Year	**1**	**2**	**3**	**4**
Capacity utilisation (%)	70	80	90	100
Production programme (tons)	31.5	36	40.5	45

IV. MATERIALS AND INPUTS

A. RAW MATERIALS

The annual material requirement of the plant is shown in Table 4.1 below.

Table 4.1

ANNUAL RAW MATERIAL REQUIREMENT

No	Raw Material	Unit	Annual Consumption	('000 Birr)		
				FC	LC	Total
1	Lime	ton	42		210	210
2	Hydrochloric Acid	"	16	512	128	640
3	Sodium Silicate	"	8		24	24
	Total					

In addition to the above raw materials the annual requirement of packaging materials will be 900 bags of 50kg holding capacity the total annual cost of which is estimated at Birr 4,500.

B. UTILITIES

Utilities such as oil, water and electricity are required by the plant. The annual consumption is shown in Table 4.2 below.

Table 4.2

ANNUAL CONSUMPTION OF UTILITIES

No	Utility	Unit	Annual Consumption	('000 Birr)		
				F.C	L.C	Total
1	Furnace Oil	m^3	30	-	162.3	162.3
2	Water	m^3	1500	-	8.3	8.30
3	Electricity	KWH	48,000	-	23.3	23.3
	Total			**-**	**193.9**	**193.9**

V. TECHNOLOGY AND ENGINEERING

A. TECHNOLOGY

1. Production Process

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, where calcium silicate is precipitated out. The precipitate is centrifuged, washed, dried and packed in suitable containers.

2. Source of Technology

The technical data and information are compiled from a document of Small Industry research Institute of India.

B. ENGINEERING

1. Machinery and Equipment

The list of machinery and equipment required by the plant is given in Table 5.1. The total cost of these machinery and equipment is estimated at about Birr 390 thousands out of which about Birr 325 thousands will be required in foreign currency.

Table 5.1

LIST OF MACHINERY AND EQUIPMENT

No	Item
1	Rubber lined mixing Tank
2	Mild Steel mixing tank
3	Storage tank for Sodium Silicate
	Sodium Silicate dilution tank
4	Mini Boiler
	Electrical Drying ovens with trolleys
5	and trays
6	Filter Press
	Miscellaneous tools and Equipments

2. Building and Civil Works

The total land requirement is close to 1000 m^2. The built up area is estimated at 400 m^2 while the remaining part is for open space and for future expansion. The lease cost for 99 years lease holding will be Birr 79,200. Building and civil works cost about Birr 1,000,000.

3. Proposed Location

The proposed location for the plant is Hosaena town in Lemo woreda, Hadiya Zone.

VI. MANPOWER AND TRAINING REQUIREMENT

A. MANPOWER REQUIREMENT

The manpower requirement of the plant and the monthly and annual salary expenditure are shown in Table 6.1.

Table 6.1

REQUIRED MANPOWER

No	Manpower	Quantity	Monthly Salary	Annual Cost
1	General Manager	1	3,000	36,000
2	Technical "	1	2,500	30,000
3	Administrative Manager	1	1,200	14,400
4	Production Head	1	1,500	18,000
5	Supervisor	1	1,200	14,400
6	Chemist	1	1,000	12,000
7	Skilled operators	2	1,600	19,200
8	Semiskilled Operators	2	1,000	12,000
9	Maintenance crew	2	1,400	16,800
10	Unskilled (Labourers)	3	600	7,200
	Total	**15**	**15,000**	**180,000**

B. TRAINING REQUIREMENT

The technical personnel of the plant should be trained by qualified engineers of the machinery supplier. The cost of training shall be Birr 50,000.

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	5 years
Bank interest	8%
Discount cash flow	8.5%
Accounts receivable	30 days
Raw material local	30days
Work in progress	2 days
Finished products	30 days
Cash in hand	5 days
Accounts payable	30 days

A. TOTAL INITIAL INVESTMENT COST

The total investment cost of the project including working capital is estimated at Birr 1.81 million, of which 57 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

Sr. No.	Cost Items	Total Cost ('000 Birr)
1	Land lease value	79.2
2	Building and Civil Work	1,000.00
3	Plant Machinery and Equipment	390.00
4	Office Furniture and Equipment	75
5	Vehicle	0
6	Pre-production Expenditure*	100
7	Working Capital	174.94
	Total Investment cost	**1,819.1**
	Foreign Share	57

** N.B Pre-production expenditure includes interest during construction (Birr 107.72 thousand) training (Birr 50 thousand) and Birr 50 thousand costs of registration, licensing and formation of the company including legal fees, commissioning expenses, et*

B. PRODUCTION COST

The annual production cost at full operation capacity is estimated at Birr 1.54 million (see Table 7.2). The material and utility cost accounts for 69.26 per cent, while repair and maintenance take 2.67 per cent of the production cost.

Table 7.2

ANNUAL PRODUCTION COST AT FULL CAPACITY ('000 BIRR)

Items	Cost	%
Raw Material and Inputs	874.00	56.68
Utilities	193.9	12.58
Maintenance and repair	41.2	2.67
Labour direct	108	7.00
Factory overheads	36	2.33
Administration Costs	72	4.67
Total Operating Costs	1,325.10	85.94
Depreciation	116.5	7.56
Cost of Finance	100.26	6.50
Total Production Cost	**1,541.86**	**100**

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 profit to total sales, net profit to equity (Return on equity) and net profit plus interest on total investment (return on total investment) show an increasing trend during the life-time of the project.

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

2. Break-even Analysis

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.

$$BE = \frac{\text{Fixed Cost}}{\text{Sales} - \text{Variable Cost}} = 25\ \%$$

3. Pay Back Period

The investment cost and income statement projection are used to project the pay-back period. The project's initial investment will be fully recovered within 5 years.

4. Internal Rate of Return and Net Present Value

Based on the cash flow statement, the calculated IRR of the project is 20 % and the net present value at 8.5% discount rate is Birr 876,720.

D. ECONOMIC BENEFITS

The project can create employment for 15 persons. In addition to supply of the domestic needs, the project will generate Birr 692,390 in terms of tax revenue.