78. PROFILE ON CALCINATED GYPSUM PLANT

TABLE OF CONTENTS

I. SUMMARY

This profile envisages the establishment of a plant for the production of Calcinated Gypsum with a capacity of 900 tonnes per annum.

The present demand for the proposed product is estimated at 4,200 tonnes per annum. The demand is expected to reach at 6,303 tonnes by the year 2010.

The plant will create employment opportunities for 30 persons.

The total investment requirement is estimated at Birr 3.43 million, out of which Birr 1.74 million is required for plant and machinery.

The project is financially viable with an internal rate of return (IRR) of 13% and a net present value (NPV) of Birr 0.69 million, discounted at 8.5 %.

II. PRODUCT DESCRIPTION AND APPLICATION

Calcinated gypsum is hydrated calcium sulphate. The calcium sulphate dehydrate becomes commercially useful substance by calcinating (driving out the chemically bonded water) by means of heating and then grinding it to the required particle size. Gypsum is mostly used for interior wall coating and finishing, partition wall, ceilings and acquatic boards.

III. MARKET STUDY AND PLANT CAPACITY

A. MARKET STUDY

1. Past Supply And Present Demand

Demand for calcinated gypsum in Ethiopia is being met from two sources: domestic production and imports. The domestic producers fall into three categories:

- Public Sector,
- Formal Private Sector, and
- Informal Private Sector.

The sole public sector of calcinated gypsum producer is Educational Materials and Distribution Enterprise (EMPDE) which was established in 1978 E.C. with the purpose of manufacturing and selling chalk to educational institutions in the country. Although the primary purpose of its establishment was to produce writing chalk, EMPDE has also been producing and marketing gypsum, ever since it was founded, as a co-product.

Presently, the maximum attainable capacity of EMPDE for gypsum production is 1,300 tonnes per annum, while during the most recent 5 years (1992 - 1996), average annual production was about 530 tonnes.

Formally established private sector producers, having a standard plant (Calcinating Kettle), are two;

- ADK, and
- Ehtio-gypsum.

In combination, these enterprises annually produce about 1,200 tonnes of gypsum.

There are also small informal sector producers who do not have standard plant and machinery but rather carry out the process of production using crude makeshift methods. Such cottage producers number about 5, and the combined supply of calcinated gypsum originating from their activity is estimated at 400 tonnes per annum.

Although the bulk of demand for calcinated gypsum is met through local production, some amount is also imported for various purposes. The gypsum imported from overseas is generally of a higher quality and fineness; and is mainly used for medical (bone casting), ornamental and industrial purposes.

The import data of gypsum during a ten years period of time (1993 - 20020) is shown in Table 3.1.

Table 3.1
IMPORT OF GYPSUM (1993 - 2003)

Year	Gypsum Imported (Tonnes)
1993	12.4
1994	0.97
1995	434
1996	110.6
1997	60.7
1998	17.2
1999	0.2
2000	88.4
2001	132.0
2002	163.7
2003	76.4

Source : *Customs Authority, External Trade Statistics, Annual Issues.*

A glance at Table 3.1 easily reveals that import of calcinated gypsum had been erratic over the period covered by the data set. However, significant growth is observable in the years 2000 - 2002. The yearly average import in those years was 128 tonnes.

Aggregating all the above, the present total supply of gypsum comprising of domestic production and imports is thus estimated at 2,330 tonnes. Assuming supply is in equilibrium with demand, this figure could fairly approximate present effective demand.

A market study of gypsum carried out by IPS (2004), on the other hand, had come up with a demand estimate of 4,200 tonnes on the basis of consumption coefficient of the building construction sector and consumption level of the manufacturing sector. As the study treats the demand deriving from construction of new buildings, maintenance of existing buildings and industrial application of calcinated gypsum using sound methodology, this estimate is considered more plausible and adopted in this profile.

2. Projected Demand

The demand for gypsum, like many other construction materials, is a function of a number of interrelated variables. These variables that are essential in determining the magnitude and trend of the demand for gypsum are:

- the overall economic development level and growth trend of the country,
- the pattern and trend of the construction industry in general and the building construction sector in particular,
- expected technological change that affects the structure of the construction industry,
- government policies and regulations that have impact on the future level and trend of construction activities, and
- size of population and its growth rate.

In view of trends in the above variables, it is not difficult to conclude that the demand for construction materials, including calcinated gypsum, will grow in the future. Overall GDP of the country had exhibited an average annual growth rate of 6.6% during the five years period i.e., 1999/2000 - 2003/2004. This is adjusted to 7% and applied on the present effective demand that was estimated earlier, as base year figure, in order to forecast future demand of calcinated gypsum. The result, as shown in Table 3.2, ranges from 4,494 tonnes in year 2005 to 10,830 tonnes by the year 2018.

Table 3. 2
PROJECTED DEMAND FOR CALCINATED GYPSUM

Year	Projected Demand (Tonnes)
2004	4200
2005	4494
2006	4808
2007	5145
2008	5505
2009	5891
2010	6303
2011	6744
2012	7216
2013	7721
2014	8262
2015	8840
2016	9459
2017	10121
2018	10830

3. Pricing and Distribution

The price of gypsum produced by EMPDE is Birr 140/quintal (Birr 1.40/kg). Other producers sell inferior quality gypsum at much lower price, Birr 0.5 - 0.6 per kilogramme. Imported gypsum, on the other hand, fetches a price of Birr 3/kg. Assuming that good quality product will be produced by the envisaged plant a factory-gate price of Birr 130/quintal is adopted.

B. PLANT CAPACITY AND PRODUCTION PRPGRAMME

1. Plant Capacity

The annual rated capacity of the plant will be 900 tonnes per 300 working days a year, 8 hours of single shift each per day.

2. Production Programme

The plant will operate at 75% of its rated capacity in the first year, 85% in the second year and at full (100%) capacity starting from the third year and thenafter.

IV. MATERIALS AND INPUTS

A. RAW MATERIALS

The main material and inputs are gypsum and packing materials. The estimated annual cost of material and inputs at a 100% capacity utilization is given in Table 4.1.

Table 4.1
ESTIMATED ANNUAL MATERIAL AND INPUTS REQUIREMENT AND COST

Sr. No.	Description	Qty	Cost ('000 Birr)
1	Royality (3% of sales)	1170 tonnes	35.10
2	Packing Materials	36,000 pcs	21.60
	Total	**-**	**56.70**

B. UTILITIES

The major utilities required by the plant are electricity, water and fuel. The estimated annual requirement of utilities of the plant at 100% capacity utilization rate and their estimated costs are given in Table 4.2.

Table 4.2
ANNUAL UTILITIES REQUIREMENT AND ESTIMATED COST

Sr. No.	Description	Qty.	Cost ('000 Birr)
1	Electric power, kWh	172,800	138.24
2	Fuel, tonnes	30.0	90.00
3	Water, m^3	600	1.2
	Total		**229.44**

V. TECHNOLOGY AND ENGINEERING

A. TECHNOLOGY

1. Production Process

Gypsum or calcium sulphate dehydrate is quarried from the quarry and is crushed in crushers, sized in sieves and dried in a drier which uses heat recovery system. The dried gypsum is then passed to the kiln where the calcination process takes place. Then, it is crushed and packed. During the process of calcination, the gypsum loses 75% of its moisture thereby making it hydroscopic.

The production technology uses gypsum and fuel only and its waste product is mainly gaseous water and carbondioxide. Thus, the process has no adverse impact on the environment.

2. Source of Technology

The technology of calcinated gypsum production is simple. The equipment can be supplied from Denmark, India, Turkey, China or Italy. Contact can be made with the following suppliers:

i) HAJUNG
Korea Heavy Industries Construction
Fax: 0551-278-551
http//:www.hanjung.co.kr

ii) DATE MYUNG ENG Co., LTD
Add: 13783, Chong way. Desy
Shishung-shi, kyonggi
Tel: 0345-498-2670

iii) Wonji a Heavy Industries Co. Ltd
Add: 89-13,kway-and dong suyong.gu, pusan
Tel: 051-759-5090
Fax: 051-759-5092
http//:www.wonjinhi.com

B. ENGINEERING

1. Machinery and Equipment

The production equipment required by the plant and their estimated costs are given in Table 5.1.

Table 5.1
MACHINERY AND EQUIPMENT REQUIRED AND ESTIMATED COSTS

Sr. No.	Description	Qty.	Cost ('000 Birr)
1	Excavator	1	800.00
2	Loader	1	650.00
3	Kiln	1	80.00
4	Grinder and packing machine	1 set	90.00
5	Quarry equipment	set	120.00
	Total		**1740.00**

2. Land, Building and Civil Works

The total land area required by the project is 10,000m^2, of which the processing building is assumed to require 200m^2 of the area. The processing building do not require a special arrangement other than a steel structure covered with egga sheet roof. The total cost of building and civil works, at the unit cost of Birr 1,200 per m^2, is estimated at Birr 240,000.The cost of land, at the lease rate of Birr 1.2 per square meter and for 70 years of land holding, will amount to Birr 840,000. 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 1.08 million.

3. Proposed Location

The plant should be located where the raw material, infrastructure, power and utility are available. Hence, the plant is proposed to be located in Assosa zone.

VI. MANPOWER AND TRAINING REQUIREMENT

A. MANPOWER REQUIREMENT

The total manpower requirement of the plant is 22 persons. Details of manpower and estimated annual labour cost including fringe benefits are indicated in Table 6.1.

Table 6.1
MANPOWER REQUIREMENT AND ANNUAL ESTIMATED LABOUR COST

Sr. No.	Description	Req. No.	Salary, Birr	
			Monthly	Annual
1	Manager	1	2000	24000
2	Secretary	1	750	9000
3	Production head (supervisor)	1	1600	19200
4	Finance and Administration head	1	1500	18000
5	Sales person	1	750	9000
6	Store keeper	1	600	7200
7	Purchaser	1	750	9000
8	Accountant/Cashier	1	600	7200
9	Driver	4	400	19,200
10	Production	15	300	54,00
11	Guard	3	250	9000
	Total	**30**		**184,800**
	Employees' Benefit (20% of Basic Salary)	-		36,960
	Grand Total	**-**		**221,760**

B. TRAINING REQUIREMENT

The production supervisor should be given a one week on-the-job training by skilled technician of the equipment supplier during erection & commission period. The cost of training is estimated at Birr 10,000.

VII. FINANCIAL ANALYSIS

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

Construction period	1 years
Source of finance	30 % equity
	70 % loan
Tax holidays	3 years
Bank interest	7.5 %
Discounted cashflow	8.5 %
Repair and maintenance	3 % of the total plant and machinery
Accounts receivable	30 days
Raw material, local	30 days
Raw materials, import	90 days
Work in progress	5 days
Finished products	15 days
Cash in 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 3.43 million, of which 34.5 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 ('000 BIRR)
1	Land lease value	840
2.	Building and Civil Work	240
3.	Plant Machinery and Equipment	1,740
4.	Office Furniture and Equipment	10
5.	Vehicle	250
6.	Pre-production Expenditure*	165.83
7	Working Capital	150.83
	Total Investment cost	**3,434.4**
	Foreign share	**34.5%**

** N.B Pre-production expenditure includes interest during construction (Birr 150.8 thousand), training (Birr 10 thousand), and Birr 5 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 of the plant is estimated at Birr 0.94 million (see Table 7.2). The material and utility cost accounts for 30.49 per cent while repair and maintenance take 5.56 per cent of the production cost.

Table 7.2
ANNUAL PRODUCTION COST AT FULL CAPACITY ('000 BIRR)

Items	Cost	%
Raw Material and Inputs	56.7	6004
Utilities	229.44	24.45
Maintenance and repair	52.20	5.56
Labour direct	184.8	19.69
Factory overheads *	30.7	3.27
Administration Cost **	10	1.07
Total Operating Costs	**563.86**	**60.09**
Depreciation	232	24.72
Cost of Finance	142	15.13
Total Production Cost	**938.39**	**100.0**

**Factory overhead cost includes salaries and wages of supervisors, insurance of factory workers, social costs on salaries of direct labour, etc.*
*** Administrative cost includes salaries and wages, insurance, social costs, materials and services used by administrative staff etc.*

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.

$$BE = \frac{\text{Fixed Cost}}{\text{Sales} - \text{Variable cost}} = 38\%$$

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 7 years.

4. Internal Rate of Return and Net Present Value

Based on the cash flow statement, the calculated IRR of the project is 13% and the net present value (NPV) at 8.5% discount rate is Birr 0.69 million.

D. ECONOMIC BENEFITS

The project can create employment for 30 persons. In addition to supply of the domestic needs, the project will generate Birr 91 thousand per annum in terms of tax revenue when it starts to operate at full capacity. Moreover, the Regional Government can collect employment, income tax and sales tax revenue. The establishment of such factory will have a foreign exchange saving effect to the country by substituting the current imports.