

**54. PROFILE ON PRODUCTION OF
BLEACHING EARTH**

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I. SUMMARY

This profile envisages the establishment of a plant for the production of bleaching earth with a capacity of 300 tonnes per annum.

The present demand for the proposed product is estimated at 240 tonnes per annum. The demand is expected to reach at 505 tonnes by the year 2017.

The plant will create employment opportunities for 40 persons.

The total investment requirement is estimated at Birr 8.4 million, out of which Birr 2 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 2.19 million, discounted at 8.5%.

II. PRODUCT DESCRIPTION AND APPLICATION

Bentonite as a Bleaching Earth is a particular kind of clay derived from volcanic ash and consists mainly of montmorillonite with minor amount of illite, kaolinite, cristobalite and other minerals. Bentonite has strong colloidal properties and, when in contact with water, increases its volume several fold by swelling, forming a tixotropic, gelatinous substance. Main uses of Bentonite as a bleaching earth take advantages of these colloidal properties.

The main characteristics of the bleaching earth is its decolorizing power, that is the property of the earth to absorb selectively certain pigments rather than others according to the characteristics of the product to be decolourized (acidity, oxidation degree, origin and biological state etc.)

Bleaching earth as a filtering and decolorizing agent is used mainly in the production of mineral oils and greases, in production of vegetable oils and fats, fish oils and animal fats, in

the regeneration of exhausted tube oils, in the regeneration of solvent as used in dry cleaning machines.

III. MARKET STUDY AND PLANT CAPACITY

A. MARKET STUDY

1. Past Supply and Present Demand

Bleaching earth is mainly used in the productions of mineral oils and greases, in the vegetable oils and fats, regeneration of solvent as used in dry cleaning machines. But, in Ethiopia bleaching earth is widely used in the food industry mainly in the edible oil factories.

Bleaching earth is presently imported from various countries. However, import data of bleaching earth has been aggregated with other similar materials, and it is difficult to disaggregate it.

Due to this reason the-end -use approach is adopted in establishing the current demand and projection of demand. As stated earlier the major users of bleaching earth are the edible oil mills. Hence, to determine the present effective demand past production of edible oil is considered. According to the statistical Abstract of the Central Statistical Agency (2005), annual average production of edible oil during the past three years was about 8,000 tonnes.

The production technology in edible oil factory requires 30kg of bleaching earth to produce 1 ton of edible oil. Using this input coefficient, the current effective demand for bleaching earth is estimated at 240 tonnes in 2007.

2. Projected Demand

The growth of demand for bleaching earth largely depends on the domestic production of edible oil. The demand for edible oil in turn relies upon population growth, and GDP per capita growth. In projecting the demand, growth in GDP is taken into consideration. Moreover, the current production technology of edible oil will not likely to change in the future, i.e, the input coefficient of 30 kg of bleaching earth for every 1 tonne of output of edible oil will be utilized in all the forecasting period.

As per this assumption domestic production of edible oil output will increase by 7% as a result of the expected growth in GDP and population. Accordingly the projected demand is shown in Table 3.3.

Table 3.3.
PROJECTED DEMAND FOR BLEACHING EARTH (TONNES)

Year	Projected Output of Edible Oil	Projected Demand For Bleaching Earth
2006	8,000	240
2007	8,560	257
2008	9,159	275
2009	9,800	294
2010	10,483	315
2011	11,220	337
2012	12,005	360
2013	12,846	386
2014	13,745	413
2015	14,707	441
2016	15,737	472
2017	16,838	505

3. Pricing and Distribution

The ex-factory price of bleaching earth is propose to be Birr 11,000 per tonne. The product can be sold directly to main end user industries i.e. oil mills and other bulk buyers.

B. PLANT CAPACITY AND PRODUCTION PROGRAMME

1. Plant Capacity

Based on the outcome of the market study for bleaching earth, the annual production of the plant operating in a single shift a day and 300 days a year at its rated capacity is 300 tons of bleaching earth. Production can be increased by introducing additional shifts

2. Production Programme

The plant as a new entrant to the market may need certain period for developing technical, managerial and marketing skills. Considering this, the production is scheduled in such a way that the plant will start operation at 75% of its installed capacity in the first year. It will operate at 85% of its rated capacity during the 2nd year and full production will be achieved during the 3rd year and onwards. The production programme is set by deducting Sundays and public holidays in a year and assuming that repair and maintenance works will be carried out during off-production hours.

IV. MATERIALS AND INPUT

A. RAW MATERIALS

The major raw materials required for the production of bleaching earth form Bentonite are raw ore (raw Bentonite), sulfuric acid (98%) and calcium oxide. Raw Bentonite is locally available in the vicinity of Lake Abijata.

Sulfuric acid and calcium oxide are also locally available. Annual raw material requirement for a single shift operation of the plant at its rated capacity and the corresponding costs are given in Table 4.1.

Table 4.1
ANNUAL RAW MATERIAL REQUIREMENT AND COST
(AT FULL CAPACITY)

Sr. No.	Material	Qty.	Cost '000 Birr
1	Raw ore (raw Bentonite)	300 (tones)	300
2	Sulfuric acid (98%)	150 (tones)	600
3	Calcium oxide	14 (tones)	42
4	Paper/plastic bag	10,000 (Pcs)	25
	Total		967

B. UTILITIES

The major utilities required for the operation of the plant are electricity, water, steam and LPG (liquefied petroleum gas). Total electric power required for a single shift operation of the plant at its rated capacity is 100MWH. Total cost of electricity amounts to Birr 47,887 per annum. Annual requirement for water including the general purpose consumption is estimated at 12,000 cubic meters, the total cost of which is estimated to be Birr 66,000. Annual requirement for steam is 300 tonnes of steam with a pressure of 10 bars. Total cost of steam is estimated at Birr 5,175 per annum. Therefore, the total cost of utilities is estimated at Birr 119,062.

V. TECHNOLOGY AND ENGINEERING

A. TECHNOLOGY

1. Production Process

The natural decolorizing power of raw Bentonite is very low. It can be greatly increased by an acid treatment which generates the so-called "activated earth." The acid treatment of Bentonite eliminates alkalis and calcium, reducing the contents of magnesium, iron and aluminum in it. The acid treatment can be carried out by using either sulfuric acid (H_2SO_4) or hydrogen chloride (HCL). Calcium oxide is used for the neutralization of the spent acid. The production process of bleaching earth from Bentonite essentially involves the following operations. The crude clay is mixed with water to form a suspension to which sulfuric acid is added. The mixture is then heated by steam in a mixing tank up to a temperature of $40^\circ C$ and kept at this temperature for about 4 hours. Then the mixture is heated to $180^\circ C$ for one hour. After cooling the suspension is filtered through a filter press and washed in order to eliminate excess acidity. The cake of the activated earth is then dried through a pneumatic conveyor by hot air ($700^\circ C$). The product is collected in a depot and then packed.

The fuel that is utilized for the drying must not pollute the final product by odor or other impurities. For this reason natural gas or LPG are generally used, while the use of the fuel oil is to be avoided (it tends to have an incomplete combustion and soot is generated which is harmful for the characteristics of the activated bentonite). The activated earth is packed in craft paper bags or in propylene bag with an inner polyethylene of 25kg. Filling operations are carried out manually.

2. Source of Technology

India or China

B. ENGINEERING

1. Machinery and Equipment

The list of plant machinery and equipment is given in Table 5.1. The total cost of plant machinery and equipment is Birr 2,000,000 out of which Birr 1,800,000 will be in foreign currency.

2. Land Building and Civil Works

The total land requirement of the plant including provision for open spaces is 5,000 sq. meters. The value of land at as per Regions lease rate is Birr 500 per annum. Total built-up area is estimated to be 2,000 sq. meters. The total cost of building at the rate of Birr 2,500/sq. meter is estimated to be Birr 5,000,000.

3. Proposed Location

The proposed location for the plant is Brbir town in West Abaya woreda, Gamo Gofa Zone.

Table 5.1

MACHINERY AND EQUIPMENT REQUIREMENT

Sr. No	Description	Qty (No.)
1	Feeding hopper	1
2	Band conveyor	1
3	Mixer(suspension forming)	1
4	Steam reactor (mixing tank)	1
5	Cooler	1
6	Filter press	1
7	Washer	1
8	Drying pneumatic conveyor	1
9	Storage tank	1
10	Boiler	1

VI. MANPOWER AND TRAINING REQUIREMENT

A. MANPOWER REQUIREMENT

Total direct and indirect manpower of the plant is 40 people. The manpower required for a single shift operation of the plant and the corresponding labor cost including employees benefit is shown in Table 6.1.

B. TRAINING REQUIREMENT

The chemist, the production manager and the chief engineer should have a thorough training on the technology involved and on the problems of machinery corrosion. Total cost of training is estimated at Birr 25,000, out of which 80% will be in foreign currency.

Table 6.1
MANPOWER REQUIREMENT AND LABOUR COST

Sr. No.	Position	Req. No.	Salary, Birr	
			Monthly	Annual
1	General manager	1	1,400	16,800
2	Technical manger	1	1,200	14,400
3	Production manager	1	1,000	12,000
4	Shift foreman	1	400	4800
5	Skilled operator	8	2,400	28,800
6	Chemist/analyst	1	600	7,200
7	Production clerk	1	300	3,600
8	Unskilled production worker	2	300	3,600
9	Chief engineer	1	1,000	12,000
10	Maintenance supervisor	1	450	5,400
11	Electrician	1	400	4,800
12	Mechanic	2	800	9,600
13	Unskilled maintenance worker	3	450	5,400
14	Financial manager	1	1,000	12,000
15	Senior accountant	1	700	8,400
16	Purchaser	1	300	3,600
17	Store keeper	1	300	3,600
18	Sales office head	1	400	4,800
19	Secretary	4	1,600	19,200
20	Driver(including the bentonite transportation)	4	1,400	16,800
21	Watchman	3	600	7,200
Sub total			17,000	204,000
Employees' Benefit(25% of Basic Salary)			4,250	51,000
Total		40	21,250	255,000

VII. FINANCIAL ANALYSIS

The financial analysis of the bleaching earth 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	3 years
Bank interest	8%
Discount cash flow	8.5%
Accounts receivable	30 days
Raw material local	30days
Raw material, import	90days
Work in progress	3 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 8.4 million, of which 38 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	30.0
2	Building and Civil Work	5,000.0
3	Plant Machinery and Equipment	2,000.0
4	Office Furniture and Equipment	125.0
5	Vehicle	450.0
6	Pre-production Expenditure*	620.7
7	Working Capital	177.5
	Total Investment cost	8,403.2
	Foreign Share	38

* *N.B Pre-production expenditure includes interest during construction (Birr 470.65 thousand) training (Birr 25 thousand) and Birr 125 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 2.48 million (see Table 7.2). The material and utility cost accounts for 43.86 per cent, while repair and maintenance take 3.03 per cent of the production cost.

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

Items	Cost	%
Raw Material and Inputs	967.00	39.05
Utilities	119.06	4.81
Maintenance and repair	75	3.03
Labour direct	153	6.18
Factory overheads	51	2.06
Administration Costs	153	6.18
Total Operating Costs	1,518.06	61.31
Depreciation	582.5	23.53
Cost of Finance	375.48	15.16
Total Production Cost	2,476.04	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.

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

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 6 years.

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 8.5% discount rate is Birr 2.19 million.

D. ECONOMIC BENEFITS

The project can create employment for 40 persons. In addition to supply of the domestic needs, the project will generate Birr 2.30 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.