

**107. PROFILE ON THE PRODUCTION
REFRACTORY BRICKS**

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I. SUMMARY

This profile envisages the establishment of a plant for the production of refractory bricks with a capacity of 6,000 tons per annum. Refractory bricks are used by all industries needing high temperature operations.

The demand for refractory bricks is entirely met through import. The present (2012) demand for refractory bricks is estimated at 5,817 tons. The demand for refractory bricks is projected to reach 9,802 tons and 16,517 tons by the year 2017 and 2022, respectively.

The principal raw materials required by the envisaged plant are kaolin, feldspar, quartz, lime and dolomite. All raw materials required by the envisaged plant are locally available.

The total investment cost of the project including working capital is estimated at Birr 33.36 million. From the total investment cost, the highest share (Birr 27 million or 80.96%) is accounted by fixed investment cost followed by initial working capital (Birr 3.28 million or 9.84%) and initial working capital (Birr 3.07 million or 9.20%). From the total investment cost, Birr 13.80 million or 41.36% is required in foreign currency.

The project is financially viable with an internal rate of return (IRR) of 33.86% and a net present value (NPV) of Birr 39.77 million discounted at 10%.

The project can create employment for 50 persons. The establishment of such factory will have a foreign exchange saving effect to the country by substituting the current imports. The project will also create backward linkage with the mining sector and forward linkage with manufacturing sub sector and also generates income for the Government in terms of tax revenue and payroll tax.

II. PRODUCT DESCRIPTION AND APPLICATION

All industries needing high temperature operations are depending on the refractory brick industry for materials of construction. The refractory brick industry likewise depends upon these industries as the chief consumers of refractories. Refractory materials have been classified in to three classes:

- Acid Refractories,
- Neutral Refractories ,and
- Basic Refractories.

Basic refractory brick do not react with basic slag's and are thus of considerable importance of furnace linings where basic slag's are encountered as in basic open hearths and in furnaces for non ferrous metallurgical operations, The basic refractories are used for lining and construction of high temperature kilns and furnaces in the field of basic open hearth furnace, steel melting furnaces and other furnaces producing and refining non-ferrous metals etc. Refractory ceramics are used for lining and construction of high temperature kilns and furnaces. Hence, they have got wide applications in iron and steel plants, foundries, cement factories, and also in the glass, ceramic, fertilizer and chemical industries. Because of the incombustible and chemical resistant properties all sorts of ceramic products have played a constructive role in the construction industries.

III. MARKET STYDY AND PLANCT CAPACEITY

A. MARKET STUDY

1. Past Supply and Present Demand

A refractory brick is built primarily to withstand high temperature, but will also usually have a low thermal conductivity for greater energy efficiency. Usually dense firebricks are used in applications with extreme mechanical, chemical, or thermal stresses, such as the inside of a wood-fired kiln or a furnace, which is subject to abrasion from wood, fluxing from ash or slag, and high temperature

Ethiopia`s demand for refractory bricks is entirely met through import. Import of refractory bricks during the period 2002-2011 is shown in Table 3.1.

Table 3.1
IMPORT OF REFRACTORY BRICKS (TONS)

Year	Import
2002	651
2003	2,002
2004	2,116
2005	1,631
2006	3,286
2007	5,731
2008	3,656
2009	2,866
2010	7,072
2011	4,562

Source: - Ethiopian Revenue and Customs Authority.

As can be seen from Table 3.1, during the period under consideration import or total supply of refractor bricks exhibits a substantial growth though fluctuates from year to year. For example the average annual import of the product during the first five year (2002-2002-2006) was 1,937 tons. However, during the recent five years (2007--2011) the annual average import has increased by more than two folds to 4,777 tons.

Due to the nature of the product`s supply data, it is assumed that the average import during the recent two years (2010-2011) is a faire approximate of the present demand. Accordingly, the current effective demand for refractory bricks is estimated at 5,817 tons.

2. Demand Projection

As the growth of the manufacturing sector has a direct impact on the demand for refractory bricks, hence the expected average annual growth of the manufacturing sector is considered to forecast the demand for refractory bricks. As per the Growth and Transformation Plan, the manufacturing sector is forecasted to grow 11%. Accordingly, taking the estimated present demand as a base and applying a growth rate of 11% the projected demand for refractory bricks is shown in Table 3.2.

Table 3.2

PROJECTED DEMAND FOR REFRACTORY BRICKS (TONS)

Year	Projected Demand
2013	6,457
2014	7,167
2015	7,956
2016	8,831
2017	9,802
2018	10,881
2019	12,077
2020	13,406
2021	14,881
2022	16,517

3. Pricing and Distribution

Based on the current CIF price of the product and adding 25% for import related expenses, the recommended factory- gate price is Birr 7,444 per ton. The product is mainly demanded by these industries that operate with high temperature. Since the number of such industries are limited in number but with high requirement direct distribution to the end user industries is recommended.

B. PLANT CAPACITY AND PRODUCTION PROGRAM

1. Plant Capacity

Based on the market study presented above and technical considerations, the envisaged refractory bricks production plant will have a production capacity of 6,000 tones per year working 300 days, single shift of eight hours a day.

2. Production Program

The plant will start production at 75%, 85% and 100% capacity in the first, second and third year and then after, respectively.

Table 3.3

ANNUAL PRODUCTION PROGRAM

Year	1	2	3
Capacity utilization (%)	75	85	100
Production (tons)	3375	5100	6000

IV. MATERIALS AND INPUTS

A. RAW MATERIALS

The main raw materials of refractory bricks are kaolin, feldspar, quartz, lime and dolomite. All raw materials required by the envisaged plant are locally available. The detail annual raw materials requirement at full production capacity is presented in Table 4.1.

Table 4.1**ANNUAL RAW MATERIALS REQUIREMENT & COST**

No.	Description	Qty (tons)	Unit Cost (Birr)	Total Cost ('000 birr)		
				FC	LC	TC
1	Kaolin	3,525	1,440	--	5,076	5,076
2	Feldspar	1,140	1,245	--	1,420	1,420
3	Quartz	750	1,200	--	900	900
4	Lime	501	1,056	--	529	529
5	Dolomite	249	1,920	--	478	478
Grand Total				--	8,403	8,403

B. UTILITIES

Major utilities for refractory bricks production are fuel oil for drying and burning the product, electric power for machine drive and water for general purpose. The annual consumption of these utilities and cost at full capacity operation is shown in Table 4.2.

Table 4.2**ANNUAL CONSUMPTION OF UTILITIES AND COST**

Sr. No.	Description	Qty.	Cost ('000 Birr)
1	Fuel oil (litters)	1,000,000	14,500.00
2	Electric power (kWh)	800,000	502.60
3	Water (m ³)	250,000	2500.00
	Total	-	17,502.60

V. TECHNOLOGY AND ENGINEERING

A. TECHNOLOGY

1. Process Description

The most common practice of bricks production involves several units of operations such as:

a) Body Preparation

The raw materials are roughly crushed by the jaw crusher and roll crusher, and then sieved into designated particle sizes, weighed, and then mixed with the required amount of water to be micro-reduced by a ball mill. The slip is further sieved and passed through the magnetic filter so that it is free from iron impurity as well as being uniform in particle size.

b) Shaping

Shaping is done by the pressing method. Before the pressing operation done, the mixing slip is pumped through an atomizer device that produces fine droplets in to the main drying chamber. The hot drying gas can be passed as a counter flow to the atomizer direction. Then the fine powders falls from the spray dryer on the belt conveyer and fed to the pressing machine for forming and pressing.

c) Firing

When pressing operation is completed the refractory ceramics are ready for firing. Then the products are fed to the tunnel kiln for firing. The firing operation will be done within the range of 10,600c to 11,000c.

d) Inspection

After the final inspection carried out, the items will be palletized and wrapped using polypropylene for dispatch.

The technological process involves size reduction and high temperature firing. So the dust to be generated in the process will be controlled by the wet process operation. The only waste to be generated in the process is scrapes which are recyclable.

2. Environmental Impact Assessment

The technological process has no any adverse impact on the environment.

B. ENGINEERING

1. Machinery and Equipment

The total cost of the machinery and equipment is estimated at Birr 17.9 million. The machinery and equipment required along with estimated cost are listed in Table 5.1.

Table 5.1
MACHINERY AND EQUIPMENT REQUIREMENT & COST

Sr. No.	Description	Qty.	Cost (in million Birr)		
			LC	FC	Total
1	Body preparation				
	Ball mill	3		5.184	5.184
	Empty pipe line	Set			
	Concrete blunger	4			
	Discharge line, water dosing etc.	Set			
2	Forming				
	Spray dryer	1		1.866	1.866
	Pumps	4			
	Belt conveyer	4			
3	Pressing				
	Hydraulic press	1		1.20	1.20
4	Firing				
	Tunnel kiln	1		2.932	2.932
	Kiln car	30		1.761	1.761
	Truck	LS		0.84	0.84
Total				13.80	13.80
Insurance, Customs Duty, Inland Transport, Bank Charge, Etc.		-	4.140		4.140
Grand Total				4.140	13.80
				13.80	17.94

2. Land, Building and Civil Works

The envisaged plant will require a total land area of 3,000 m². The floor space required for the building of and other facilities will be about 2000 m². The total estimated cost of building and civil works at the rate of Birr 3200 per m² is about Birr 7,040,000.

According to the Federal Legislation on the Lease Holding of Urban Land (Proclamation No. 721/2004) 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 below 5,000 m², 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 m², 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.

Moreover, the Addis Ababa City Administration has recently adopted a new land lease floor price for plots in the city. The new prices will be used as a benchmark for plots that are going to be auctioned by the city government or transferred under the new "Urban Lands Lease Holding Proclamation."

The new regulation classified the city into three zones. The first Zone is Central Market District Zone, which is classified in five levels and the floor land lease price ranges from Birr 1,686 to Birr 894 per m². The rate for Central Market District Zone will be applicable in most areas of the city that are considered to be main business areas that entertain high level of business activities.

The second zone, Transitional Zone, will also have five levels and the floor land lease price ranges from Birr 1,035 to Birr 555 per m². This zone includes places that are surrounding the city and are occupied by mainly residential units and industries.

The last and the third zone, Expansion Zone, is classified into four levels and covers areas that are considered to be in the outskirts of the city, where the city is expected to expand in the future. The floor land lease price in the Expansion Zone ranges from Birr 355 to Birr 191 per m² (see Table 5.2).

Table 5.2

NEW LAND LEASE FLOOR PRICE FOR PLOTS IN ADDIS ABABA

Zone	Level	Floor Price/m²
Central Market District	1 st	1686
	2 nd	1535
	3 rd	1323
	4 th	1085
	5 th	894

Zone	Level	Floor Price/m²
Transitional zone	1 st	1035
	2 nd	935
	3 rd	809
	4 th	685
	5 th	555
Expansion zone	1 st	355
	2 nd	299
	3 rd	217
	4 th	191

Accordingly, in order to estimate the land lease cost of the project profiles it is assumed that all new manufacturing projects will be located in industrial zones located in expansion zones. Therefore, for the profile a land lease rate of Birr 266 per m² which is equivalent to the average floor price of plots located in expansion zone 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 criteria are creation of job opportunity, foreign exchange saving, investment capital and land utilization tendency etc. Accordingly, Table 5.3 shows incentives for lease payment.

Table 5.3

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 land lease period for industry is 60 years.

Accordingly, the total land lease cost at a rate of Birr 266 per m² is estimated at Birr 798,000 of which 10% or Birr 79,800 will be paid in advance. The remaining Birr 718,200 will be paid in equal installments with in 28 years i.e. Birr 25,650 annually

VI. HUMANRESIOURCE AND TRAINING REQUIREMENT

A. HUMANRESIOURCE REQUIREMENT

The envisaged refractory bricks project requires a total of 50 workforces, both a combination of administrative and production skilled and unskilled personnel. The list of manpower required and corresponding labor cost is shown in Table 6.1.

Table 6.1
HUMANRESIOURCE REQUIREMENT AND ANNUAL LABOR COST

Description	Required Number	Salary in Birr	
		Monthly	Annually
A. Administrative staff			
1. General Manager	1	6,000	72,000
2. Secretary	1	2,200	26,400
3. Finance and Admin	1	4,500	54,000
4. Accounting clerk	1	1,800	21,600
5. Store man	1	1,600	19,200
6. General Service	8	800	76,800
Sub-total	13		270,000
B. Production staff			
1. Production head	1	4,000	48,000
2. Supervisor	3	2,500	90,000
3. Machine operators	4	1,300	62,400
4. Mechanic/ Electrician	3	1,800	64,800
5. Skilled worker	14	1,800	302,400
6. Unskilled /workers	5	900	54,000
7. Quality Control Staff	4	2,400	115,200
8. Laboratory	3	1,800	64,800
Sub-total	37		801,600
Total (A+B)	50		1,071,600
Benefits (15%)			160,740
Grand Total			1,232,340

B. TRAINING REQUIREMENT

Due to focus of the government on technical training, skilled workers on construction materials production are available only specific training will be offered to the production supervisor, kiln operations, and press operators that extending for two months time. The total cost for such training is estimated birr 75,000.

VII. FINANCIAL ANALYSIS

The financial analysis of the refractory bricks 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	10%
Discount cash flow	10%
Accounts receivable	30 days
Raw material local	30 days
Work in progress	1 day
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 33.36 million (see Table 7.1). From the total investment cost, the highest share (Birr 27 million or 80.96%) is accounted by fixed investment cost followed by initial working capital (Birr 3.28 million or 9.84%) and initial working capital (Birr 3.07 million or 9.20%). From the total investment cost, Birr 13.80 million or 41.36% is required in foreign currency.

Table 7.1**INITIAL INVESTMENT COST ('000 Birr)**

Sr. No.	Cost Items	Local Cost	Foreign Cost	Total Cost	% Share
1	Fixed investment				
1.1	Land Lease	79.80		79.80	0.24
1.2	Building and civil work	7,040.00		7,040.00	21.10
1.3	Machinery and equipment	4,140.00	13,800.00	17,940.00	53.77
1.4	Vehicles	1,500.00		1,500.00	4.50
1.5	Office furniture and equipment	450.00		450.00	1.35
	Sub total	13,209.80	13,800.00	27,009.80	80.96
2	Pre operating cost *				
2.1	Pre operating cost	888.20		888.20	2.66
2.2	Interest during construction	2,182.68		2,182.68	6.54
	Sub total	3,070.88		3,070.88	9.20
3	Working capital	3,283.09		3,283.09	9.84
	Grand Total	19,563.77	13,800.00	33,363.77	100

* *N.B Pre operating cost include project implementation cost such as installation, startup, commissioning, project engineering, project management etc and capitalized interest during construction.*

** *The total working capital required at full capacity operation is Birr 4.36 million. However, only the initial working capital of Birr 3.28 million during the first year of production is assumed to be funded through external sources. During the remaining years the working capital requirement will be financed by funds to be generated internally (for detail working capital requirement see Appendix 7.A.1).*

B. PRODUCTION COST

The annual production cost at full operation capacity is estimated at Birr 34.92 million (see Table 7.2). The cost of raw material and utility account for 74.19% of the production cost. The other major components of the production cost are depreciation, financial cost and labor which account for 12.58%, 6.02% and 3.07%, respectively. The remaining 4.15% is the share of repair and maintenance, labor overhead, marketing and distribution and administration cost. For detail production cost see Appendix 7.A.2.

Table 7.2**ANNUAL PRODUCTION COST AT FULL CAPACITY (YEAR THREE)**

Items	Cost (000 Birr)	%
Raw Material and Inputs	8,403.00	24.06
Utilities	17,503.00	50.12
Maintenance and repair	538.00	1.54
Labor direct	1,072.00	3.07
Labor overheads	161.00	0.46
Administration Costs	250.00	0.72
Land lease cost	-	-
Cost of marketing and distribution	500.00	1.43
Total Operating Costs	28,427.00	81.41
Depreciation	4,392.24	12.58
Cost of Finance	2,100.83	6.02
Total Production Cost	34,920.07	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 4.87 million to Birr 9.42 million during the life of the project. Moreover, at the end of the project life the accumulated net cash flow amounts to Birr 83.26 million. For profit and loss statement and cash flow projection see Appendix 7.A.3 and 7.A.4, respectively.

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 for capacity utilization and sales value estimated by using income statement projection are computed as followed.

$$\text{Break- Even Sales Value} = \frac{\text{Fixed Cost} + \text{Financial Cost}}{\text{Variable Margin ratio (\%)}} = \text{Birr } 14,437,799$$

$$\text{Break -Even Capacity utilization} = \frac{\text{Break -even Sales Value}}{\text{Sales revenue}} \times 100 = 34 \%$$

4. Pay-back Period

The pay- back period, also called pay- off period is defined as the period required for recovering 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 3 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 33.86% 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 principle, a project is accepted if the NPV is non-negative.

Accordingly, the net present value of the project at 10% discount rate is found to be Birr 39.77 million which is acceptable. For detail discounted cash flow see Appendix 7.A.5.

D. ECONOMIC AND SOCIAL BENEFITS

The project can create employment for 50 persons. The project will generate Birr 23.94 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 project will also create backward and forward linkage with the mining and manufacturing sub sectors and also generate income for the Government in terms of payroll tax.

Appendix 7.A
FINANCIAL ANALYSES SUPPORTING TABLES

Appendix 7.A.2
PRODUCTION COST (in 000 Birr)

Item	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11
Raw Material and Inputs	6,302	7,143	8,403	8,403	8,403	8,403	8,403	8,403	8,403	8,403
Utilities	13,127	14,878	17,503	17,503	17,503	17,503	17,503	17,503	17,503	17,503
Maintenance and repair	404	457	538	538	538	538	538	538	538	538
Labour direct	804	911	1,072	1,072	1,072	1,072	1,072	1,072	1,072	1,072
Labour overheads	121	137	161	161	161	161	161	161	161	161
Administration Costs	188	213	250	250	250	250	250	250	250	250
Land lease cost	0	0	0	0	26	26	26	26	26	26
Cost of marketing and distribution	500	500	500	500	500	500	500	500	500	500
Total Operating Costs	21,445	24,238	28,427	28,427	28,453	28,453	28,453	28,453	28,453	28,453
Depreciation	4,392	4,392	4,392	4,392	4,392	327	327	327	327	327
Cost of Finance	0	2,401	2,101	1,801	1,501	1,200	900	600	300	0
Total Production Cost	25,837	31,031	34,920	34,620	34,345	29,980	29,680	29,379	29,079	28,779

Appendix 7.A.3
INCOME STATEMENT (in 000 Birr)

Item	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11
Sales revenue	31,680	35,904	42,240	42,240	42,240	42,240	42,240	42,240	42,240	42,240
Less variable costs	20,945	23,738	27,927	27,927	27,927	27,927	27,927	27,927	27,927	27,927
VARIABLE MARGIN	10,735	12,166	14,313	14,313	14,313	14,313	14,313	14,313	14,313	14,313
in % of sales revenue	33.88	33.88	33.88	33.88	33.88	33.88	33.88	33.88	33.88	33.88
Less fixed costs	4,892	4,892	4,892	4,892	4,918	852	852	852	852	852
OPERATIONAL MARGIN	5,843	7,274	9,421	9,421	9,395	13,461	13,461	13,461	13,461	13,461
in % of sales revenue	18.44	20.26	22.30	22.30	22.24	31.87	31.87	31.87	31.87	31.87
Financial costs		2,401	2,101	1,801	1,501	1,200	900	600	300	0
GROSS PROFIT	5,843	4,873	7,320	7,620	7,895	12,260	12,560	12,861	13,161	13,461
in % of sales revenue	18.44	13.57	17.33	18.04	18.69	29.03	29.74	30.45	31.16	31.87
Income (corporate) tax	0	0	0	2,286	2,368	3,678	3,768	3,858	3,948	4,038
NET PROFIT	5,843	4,873	7,320	5,334	5,526	8,582	8,792	9,002	9,212	9,423
in % of sales revenue	18.44	13.57	17.33	12.63	13.08	20.32	20.82	21.31	21.81	22.31

Appendix 7.A.4**CASH FLOW FOR FINANCIAL MANAGEMENT (in 000 Birr)**

Item	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Scrap
TOTAL CASH INFLOW	27,898	37,246	35,917	42,260	42,240	42,240	42,240	42,240	42,240	42,240	42,240	10,853
Inflow funds	27,898	5,566	13	20	0	0	0	0	0	0	0	0
Inflow operation	0	31,680	35,904	42,240	42,240	42,240	42,240	42,240	42,240	42,240	42,240	0
Other income	0	0	0	0	0	0	0	0	0	0	0	10,853
TOTAL CASH OUTFLOW	27,898	27,012	30,086	34,197	35,515	35,325	36,332	36,122	35,912	35,702	32,491	0
Increase in fixed assets	27,898	0	0	0	0	0	0	0	0	0	0	0
Increase in current assets	0	3,384	446	668	0	2	0	0	0	0	0	0
Operating costs	0	20,945	23,738	27,927	27,927	27,953	27,953	27,953	27,953	27,953	27,953	0
Marketing and Distribution cost	0	500	500	500	500	500	500	500	500	500	500	0
Income tax	0	0	0	0	2,286	2,368	3,678	3,768	3,858	3,948	4,038	0
Financial costs	0	2,183	2,401	2,101	1,801	1,501	1,200	900	600	300	0	0
Loan repayment	0	0	3,001	3,001	3,001	3,001	3,001	3,001	3,001	3,001	0	0
SURPLUS (DEFICIT)	0	10,235	5,832	8,063	6,725	6,915	5,908	6,118	6,328	6,538	9,749	10,853
CUMULATIVE CASH BALANCE	0	10,235	16,066	24,129	30,854	37,769	43,677	49,794	56,122	62,660	72,409	83,262

Appendix 7.A.5**DISCOUNTED CASH FLOW (in 000 Birr)**

Item	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Scrap
TOTAL CASH INFLOW	0	31,680	35,904	42,240	42,240	42,240	42,240	42,240	42,240	42,240	42,240	10,853
Inflow operation	0	31,680	35,904	42,240	42,240	42,240	42,240	42,240	42,240	42,240	42,240	0
Other income	0	0	0	0	0	0	0	0	0	0	0	10,853
TOTAL CASH OUTFLOW	31,181	21,877	24,886	28,427	30,716	30,821	32,131	32,221	32,311	32,401	32,491	0
Increase in fixed assets	27,898	0	0	0	0	0	0	0	0	0	0	0
Increase in net working capital	3,283	432	648	0	2	0	0	0	0	0	0	0
Operating costs	0	20,945	23,738	27,927	27,927	27,953	27,953	27,953	27,953	27,953	27,953	0
Marketing and Distribution cost	0	500	500	500	500	500	500	500	500	500	500	0
Income (corporate) tax		0	0	0	2,286	2,368	3,678	3,768	3,858	3,948	4,038	0
NET CASH FLOW	-31,181	9,803	11,018	13,813	11,524	11,419	10,109	10,019	9,929	9,839	9,749	10,853
CUMULATIVE NET CASH FLOW	-31,181	-21,379	-10,361	3,452	14,977	26,396	36,505	46,524	56,453	66,293	76,042	86,894
Net present value	-31,181	8,911	9,106	10,378	7,871	7,090	5,706	5,141	4,632	4,173	3,759	4,184
Cumulative net present value	-31,181	-22,270	-13,164	-2,786	5,085	12,175	17,882	23,023	27,655	31,828	35,587	39,771

NET PRESENT VALUE 39,771
INTERNAL RATE OF RETURN 33.86%
NORMAL PAYBACK 3 years

