

**165. PROFILE ON THE PRODUCTION OF DISC
BRAKE PADS, LININGS**

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I. SUMMARY

This profile envisages the establishment of a plant for the production of disc brake pads, linings with a capacity of 40,000 pieces (145 gm per piece average weight) per annum. Disk brake linings are friction materials used in vehicles for the purpose of generating friction between two contact surfaces in order to produce a required effect.

The demand for disc brake pads, linings is met entirely through import. The present (2012) demand for disc brake linings is estimated at 590 tons. The demand for disc brake linings is projected to reach 947 tons and 1,329 tons by the year 2017 and 2022, respectively.

The principal raw materials required are asbestos and resin, which have to be imported.

The total investment cost of the project including working capital is estimated at Birr 6 million. From the total investment cost the highest share (Birr 4.22 million or 70.45%) is accounted by fixed investment cost followed by initial working capital (Birr 998.86 thousand or 16.64%) and pre operation cost (Birr 774.36 thousand or 12.90%). From the total investment cost Birr 932.25 thousand or 15.53% is required in foreign currency.

The project is financially viable with an internal rate of return (IRR) of 26.74% and a net present value (NPV) of Birr 5.19 million discounted at 10%.

The project can create employment for 21 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 forward linkage with the automotive sub sector and also generates income for the Government in terms of tax revenue and payroll tax.

II. PRODUCT DESCRIPTION AND APPLICATION

Disk brake linings are friction materials used in vehicles for the purpose of generating friction between two contact surfaces in order to produce a required effect. One requirement of brake linings is to withstand heat and wear, whenever friction is generated.

Automotive and industrial brakes use lining made of either woven form of asbestos fibers mixed with fillers and bonding material, and some cotton or copper wire or other suitable materials. Materials used to bind and saturate the linings to make them imperious to oil and moisture are asphalt, natural gum, oil and synthetic resin

III. MARKET STUDY AND PLANT CAPACITY

A. MARKET STUDY

1. Past Supply and Present Demand

There is no factory in the country that produces disk brake pads and linings. The country's demand for the product is met through import. The Ethiopian Customs Authority Trade Statistics registers import of break lining in two categories. These are brake lining and pads of asbestos and mounted brake linings for motor vehicles. The quantity and value of imported brake linings during the period 2000-2010 is presented in Table 3.1.

Table 3.1
IMPORT OF DISC BRAKE LININGS BY TYPE
(QUANTITY IN TONNES, VALUE IN BIRR)

Year	Brake lining & pads of Asbestos & other Materials		Mounted Brake Linings for Motor Vehicles		Total	
	Qty	Value	Qty	Value	Qty	Value
2000	200.3	4,761,174	51.8	2,066,193	252.1	6,827,367
2001	194.8	4,101,657	16.7	1,336,191	211.5	5,437,848
2002	201.1	5,008,095	26.8	2,315,914	227.9	7,324,009
2003	236.5	4,387,038	7.9	1,201,238	244.4	5,588,276
2004	295.7	7,231,243	37.9	1,168,460	333.6	8,399,703
2005	392.8	7,231,244	52.9	2,834,031	445.7	10,071,275
2006	512.6	12,083,323	45.1	2,624,297	557.7	14,707,620

Year	Brake lining & pads of Asbestos & other Materials		Mounted Brake Linings for Motor Vehicles		Total	
	Qty	Value	Qty	Value	Qty	Value
2007	355.1	9,479,421	78.4	3,688,159	433.5	13,167,580
2008	573.0	143,444	52.3	79,867	625.3	223,311
2009	597.0	11,564, 512	57.0	2,561,531	654.0	14,126,043
2010	621.3	10,354,627	58.0	3,125,912	679.3	134,80,539
Total	4,180.2	69,542,440	484.7	23,001,793	4,664.7	85,227,528
Average	380.0	6,322,040	44.1	2,091,072.1	424.1	7,747,957

As could be seen from Table 3.1, the total import figure of brake linings in the past eleven years ranges from 211.5 tons to 679.3 tons. The country has imported an average of 424 tons of disc brake linings per year for the last eleven years,

The data shows that except a slight decline in the years 2001, 2002, and 2007 import has shown an increasing trend. The average growth rate for the whole period was about 11%. The data also shows that of the total import about 90% is the share of brake linings & pads of asbestos while the remaining 10% is the import of mounted brake linings for motor vehicles.

To estimate the current effective demand the average of import registered in the last five years, which is 590 tons has been applied.

2. Projected Demand

The road transport dependence for both passenger and freight traffic is increasing. The road construction being undertaken as pre-requisite for investment and development, guarantees a healthy and continuously growing auto component industry. Although the number of vehicles in the country has shown a higher growth rate in order to be conservative an annual average growth rate of 7% is used in projecting the future demand for brake linings (see Table 3.2).

Table 3.2
PROJECTED DEMAND FOR BRAKE LININGS (TONS)

Year	Projected Demand
2011	631
2012	675
2013	723
2014	773
2015	828
2016	885
2017	947
2018	1,014
2019	1,085
2020	1,161
2021	1,242
2022	1,329

3. Pricing and Distribution

The price of disk brake lining varies according to the type and size of motor vehicles. However, the current average price of brake linings of asbestos is Birr 225 per pieces. Allowing 25% for distributors and retailers the recommended factory gate price is Birr 180 per pieces. The product will find its market outlet through the existing motor vehicles spare parts distributing enterprise.

B. PLANT CAPACITY AND PRODUCTION PROGRAM

1. Plant Capacity

The market study shows high demand gap for disc brake lining. However, it is advisable to start production at a lower scale. It is thus proposed that a plant with a production capacity of 40,000 pieces (145 gm per piece average weight) of brake lining per annum, be established. The brake lining will have a specification of 45 x 5.6 x 240.110 R or (width x thickness x length-inside of lining x radius). The plant will operate by a single shift of eight hours a day, and 300 days a year.

2. Production Program

The plant will start operation at 75% of its installed capacity. Production capacity will then build up to 85% and 100% in the second and third year respectively. It is then assumed that production will be maintained at 100% in the subsequent years. Table 3.3 below shows production program of disc brake lining.

Table 3.3

PRODUCTION PROGRAM

Year	Capacity Utilization (%)	Production (pcs)	Production (tonnes)
1	75	30,000	4.35
2	85	34,000	4.93
3-15	100	40,000	5.80

IV. MATERIALS AND INPUTS

A. RAW & AUXILIARY MATERIALS

Here, it is intended to use asbestos and resin as major raw materials. The aggregate cost of raw materials required by the plant is estimated at Birr 3.96 million, out of which about Birr 3.6 million will be required in foreign currency. The raw materials indicated above are not available locally. They are to be imported from Europe, Middle East, and Asia. Auxiliary materials required by the proposed plant include friction particles, organic and inorganic fillers. Annual requirement of raw and auxiliary materials and corresponding costs are shown in Table 4.1.

B. UTILITIES

Utilities required by disk brake lining plant are electricity and water. Electricity is required for running production machinery and for lighting purposes. Water is required for drinking and general purposes. The annual power requirement of the plant is estimate at 124,468 kWh and that of water is about 4,333 m³. The total utilities cost is estimated at about Birr 106,582.

Table 4.1
RAW AND AUXILIARY MATERIALS (AT FULL CAPACITY)

Sr. No.	Description	Qty (tonnes)	Cost ('000 Birr)		
			FC	LC	TC
	A. Raw Materials				
1.	Asbestos				
2.	Resin	3.00	1,020	-	1,020
		1.20	1,500	-	1,500
	Sub-Total		2,520	-	2,520
	B. Auxiliary Materials				
1.	Friction particles				
2.	Organic filler	0.60	360	-	360
3.	Inorganic filler	0.30	180	-	180
		0.90	540		540
	Sub Total		1,080		1,080
	Bank, insurance & customs changes, freight and handling costs			360	360
	Total Landed Cost		3600	360	3960

V. TECHNOLOGY AND ENGINEERING

A. TECHNOLOGY

1. Production Process

The production process of brake lining (for vehicles) involves sequential operations. The dry powder is first formed in to appropriate shape. It is formed in to a continuous sheet, and then baked in to rigid form, curved in one direction with a diameter corresponding to the finished diameter of the brake lining. In the case of large linings are half blocks for diameter of the brake lining. In the case of large linings are half blocks for commercial vehicles linings are baked individually. The linings are then finished by cutting precisely to size a grinding to ensure exact alignment with the shoe (for bonded types) and the brake drum. The linings are then drilled and riveted, and bonded to the prepared brake shoes, which may be either new or trade-in parts from garages.

2. Environmental Impact

The production processes of brake lining are powder shaping, baking, drilling and riveting, and bonding which does not discharge or emit any pollutant to the environment and hence environmental friendly.

B. ENGINEERING

1. Machinery and Equipment

Total cost of machinery and equipment is Birr 1,057,250. Machinery and equipment required by brake lining producing plant and the corresponding costs are shown in Table 5.1.

Table 5.1

MACHINERY AND EQUIPMENT REQUIREMENT AND COST

Sr. No.	Description	Qty (No.)	Unit Price (Birr)	Total Price (Birr)		
				FC	LC	TC
1.	V-type mixing machine	2	90,750	181,500	-	181,500
2.	Mixing machine	3	82,500	247,500	-	247,500
3.	Hydraulic press	1	206,250	206,250	-	206,250
4.	Oven	2	57,750	115,500	-	115,500
5.	Inside grinding machine	2	49,500	99,000	-	99,000
6.	Outside grinding machine	2	41,250	82,500	-	82,500
	Total Foreign Cost			932,250	-	932,250
	Local cost			-	125,000	125,000
	Grand Total Cost			932,250	125,000	1,057,250

2. Land, Building and Civil Works

The total land area required is 800 m² of which the total built-up area of the plant is estimated to be 400 m². The cost of building and civil work at the rate of Birr 5,000 per m² is estimated at Birr 2 million.

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 5000 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
Transitional zone	1 st	1035
	2 nd	935
	3 rd	809
	4 th	685
	5 th	555

Zone	Level	Floor price/m²
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 212,800 of which 10% or Birr 21,280 will be paid in advance. The remaining Birr 191,520 will be paid in equal installments with in 28 years i.e. Birr 6,840 annually.

VI. HUMAN RESOURCE & TRAINING REQUIREMENT

A. HUMAN RESOURCE REQUIREMENT

The plant will employ a total of 21 persons with annual cost of Birr 450,000. The human resource requirement and the corresponding labor costs are shown in Table 6.1.

B. TRAINING REQUIREMENT

Skilled manpower having the requiring training is a necessity to produce a competitive product. For this key production workers have to be provided with short term training on the technology of producing brake linings. Training expenditure is estimated at Birr 25,000.

Table 6.1

HUMAN RESOURCE REQUIREMENT AND COST

Sr. No.	Description	No.	Monthly (Birr)	Annual (Birr)
	A. Administration			
1	Plant manger	1	4,000	48,000
2	Secretary	1	1,600	19,200
3	Salesman	1	1,600	19,200
4	Store man	1	1,600	19,200
5	Clerk	2	1,600	38,400
6	General service	4	1,600	76,800
	Sub total	10	12,000	220,800
	B. Production			
1	Production supervisor	1	2,400	28,800
2	Skilled labor	6	7,200	86,400
3	Unskilled labor	4	2,000	24,000
	Sub total	11	11,600	139,200
	Total	21		360,000
	Employee's benefit (25% of			90,000
	Grand total	21		450,000

VII. FINANCIAL ANALYSIS

The financial analysis of the disc brake pads, linings project is based on the data presented in the previous chapters and the following assumptions:-

Construction period	1 year
Source of finance	30 % equity and 70% loan
Tax holidays	3 years
Bank interest	10%
Discount cash flow	10%
Accounts receivable	30 days
Raw material imported	120 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 6 million (see Table 7.1). From the total investment cost the highest share (Birr 4.22 million or 70.45%) is accounted by fixed investment cost followed by initial working capital (Birr 998.86 thousand or 16.64%) and pre operation cost (Birr 774.36 thousand or 12.90%). From the total investment cost Birr 932.25 thousand or 15.53% is required in foreign currency.

Table 7.1
INITIAL INVESTMENT COST ('000 Birr)

Sr. No	Cost Items	L.C	F.C	T.C	%
1	Fixed investment				
1.1	Land Lease	21.28		21.28	0.35
1.2	Building and civil work	2,000.00		2,000.00	33.32
1.3	Machinery and equipment	125.00	932.25	1,057.25	17.62
1.4	Vehicles	900.00		900.00	15.00
1.5	Office furniture and equipment	250.00		250.00	4.17
	Sub total	3,296.28	932.25	4,228.53	70.45
2	Pre operating cost *				
2.1	Pre operating cost	381.72		381.72	6.36
2.2	Interest during construction	392.64		392.64	6.54
	Sub total	774.36		774.36	12.90
3	Working capital **	998.86		998.86	16.64
	Grand Total	5,069.50	932.25	6,001.75	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 1.40 million. However, only the initial working capital of Birr 998.86 thousand 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 6.19 million (see Table 7.2). The cost of raw material account for 63.92% of the production cost. The other major components of the production cost are depreciation, financial cost, direct labor, which account for 9.24%, 5.23% and 5.81% respectively. The remaining 15.80% is the share of utility, repair and maintenance, labor overhead, cost of 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	3,960.00	63.92
Utilities	107.00	1.73
Maintenance and repair	32.00	0.52
Labor direct	360.00	5.81
Labor overheads	90.00	1.45
Administration Costs	250.00	4.04
Land lease cost	-	-
Cost of marketing and distribution	500.00	8.07
Total Operating Costs	5,299.00	85.53
Depreciation	572.79	9.24
Cost of Finance	323.93	5.23
Total Production Cost	6,195.72	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 608 thousand to Birr 1.25 million during the life of the project. Moreover, at the end of the project life the accumulated net cash flow amounts to Birr 12.17 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.

$$\text{Break Even Sales Value} = \frac{\text{Fixed Cost} + \text{Financial Cost}}{\text{Variable Margin ratio (\%)}} = \text{Birr } 3,217,042$$

$$\text{Break Even Capacity utilization} = \frac{\text{Break even Sales Value}}{\text{Sales revenue}} \times 100 = 45\%$$

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 4 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 26.74% 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 5.19 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 21 persons. The project will generate Birr 3.13 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 forward linkage with the automotive sub sector and also generates other income for the Government.

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	2,772	3,168	3,564	3,960	3,960	3,960	3,960	3,960	3,960	3,960
Utilities	75	86	96	107	107	107	107	107	107	107
Maintenance and repair	22	26	29	32	32	32	32	32	32	32
Labour direct	252	288	324	360	360	360	360	360	360	360
Labour overheads	63	72	81	90	90	90	90	90	90	90
Administration Costs	175	200	225	250	250	250	250	250	250	250
Land lease cost	0	0	0	0	7	7	7	7	7	7
Cost of marketing and distribution	500	500	500	500	500	500	500	500	500	500
Total Operating Costs	3,859	4,339	4,819	5,299	5,306	5,306	5,306	5,306	5,306	5,306
Depreciation	573	573	573	573	573	105	105	105	105	105
Cost of Finance	0	432	378	324	270	216	162	108	54	0
Total Production Cost	4,432	5,344	5,770	6,196	6,149	5,627	5,573	5,519	5,465	5,411

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	5,040	6,480	7,200	7,200	7,200	7,200	7,200	7,200	7,200	7,200
Less variable costs	3,359	3,839	4,319	4,799	4,799	4,799	4,799	4,799	4,799	4,799
VARIABLE MARGIN	1,681	2,641	2,881	2,401	2,401	2,401	2,401	2,401	2,401	2,401
in % of sales revenue	33.35	40.75	40.01	33.35	33.35	33.35	33.35	33.35	33.35	33.35
Less fixed costs	1,073	1,073	1,073	1,073	1,080	612	612	612	612	612
OPERATIONAL MARGIN	608	1,568	1,808	1,328	1,321	1,789	1,789	1,789	1,789	1,789
in % of sales revenue	12.06	24.20	25.11	18.45	18.35	24.85	24.85	24.85	24.85	24.85
Financial costs		432	378	324	270	216	162	108	54	0
GROSS PROFIT	608	1,136	1,430	1,004	1,051	1,573	1,627	1,681	1,735	1,789
in % of sales revenue	12.06	17.53	19.86	13.95	14.60	21.85	22.60	23.35	24.10	24.85
Income (corporate) tax	0	0	0	301	315	472	488	504	521	537
NET PROFIT	608	1,136	1,430	703	736	1,101	1,139	1,177	1,215	1,252
in % of sales revenue	12.06	17.53	19.86	9.76	10.22	15.30	15.82	16.34	16.87	17.39

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	4,610	6,454	6,483	7,203	7,200	7,200	7,200	7,200	7,200	7,200	7,200	3,024
Inflow funds	4,610	1,414	3	3	0	0	0	0	0	0	0	0
Inflow operation	0	5,040	6,480	7,200	7,200	7,200	7,200	7,200	7,200	7,200	7,200	0
Other income	0	0	0	0	0	0	0	0	0	0	0	3,024
TOTAL CASH OUTFLOW	4,610	5,274	5,451	5,877	6,604	6,432	6,534	6,496	6,458	6,420	5,843	0
Increase in fixed assets	4,610	0	0	0	0	0	0	0	0	0	0	0
Increase in current assets	0	1,022	140	140	140	1	0	0	0	0	0	0
Operating costs	0	3,359	3,839	4,319	4,799	4,806	4,806	4,806	4,806	4,806	4,806	0
Marketing and Distribution cost	0	500	500	500	500	500	500	500	500	500	500	0
Income tax	0	0	0	0	301	315	472	488	504	521	537	0
Financial costs	0	393	432	378	324	270	216	162	108	54	0	0
Loan repayment	0	0	540	540	540	540	540	540	540	540	0	0
SURPLUS (DEFICIT)	0	1,181	1,032	1,326	596	768	666	704	742	780	1,357	3,024
CUMULATIVE CASH BALANCE	0	1,181	2,213	3,539	4,135	4,904	5,570	6,274	7,016	7,796	9,153	12,177

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	5,040	6,480	7,200	7,200	7,200	7,200	7,200	7,200	7,200	7,200	3,024
Inflow operation	0	5,040	6,480	7,200	7,200	7,200	7,200	7,200	7,200	7,200	7,200	0
Other income	0	0	0	0	0	0	0	0	0	0	0	3,024
TOTAL CASH OUTFLOW	5,609	3,996	4,476	4,956	5,601	5,621	5,778	5,794	5,810	5,826	5,843	0
Increase in fixed assets	4,610	0	0	0	0	0	0	0	0	0	0	0
Increase in net working capital	999	137	137	137	1	0	0	0	0	0	0	0
Operating costs	0	3,359	3,839	4,319	4,799	4,806	4,806	4,806	4,806	4,806	4,806	0
Marketing and Distribution cost	0	500	500	500	500	500	500	500	500	500	500	0
Income (corporate) tax		0	0	0	301	315	472	488	504	521	537	0
NET CASH FLOW	-5,609	1,044	2,004	2,244	1,599	1,579	1,422	1,406	1,390	1,374	1,357	3,024
CUMULATIVE NET CASH FLOW	-5,609	-4,565	-2,561	-317	1,282	2,861	4,283	5,689	7,079	8,452	9,810	12,834
Net present value	-5,609	949	1,656	1,686	1,092	980	803	722	648	583	523	1,166
Cumulative net present value	-5,609	-4,660	-3,004	-1,318	-226	755	1,557	2,279	2,927	3,510	4,033	5,199

NET PRESENT VALUE 5,199
INTERNAL RATE OF RETURN 26.74%
NORMAL PAYBACK 4 years