

**78. PROFILE ON THE PRODUCTION OF
FIBERGLASS REINFORCED PLASTICS**

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I. SUMMARY

This profile envisages the establishment of a plant for the production of fiberglass reinforced plastics (FRP) with a capacity of 150 tons per annum. Fiberglass reinforced plastics is used in reservoirs and tanks, pipes and tubes and roof rack.

The demand for FRP is entirely met through import. The present (2012) demand for FRP reservoirs and tanks and pipes and tubes is estimated at 380 tons and 523 tons, respectively while for FRP roof racks it is estimated at 6,706 pieces. The demand for FRP reservoirs and tanks and pipes and tubes and FRP roof racks is projected to reach 611 tons 842 tons 8,559 pieces respectively by the year 2017 and 985 tons 1,356 tons 10,924 pieces, respectively by the year 2022.

The principal raw materials required by the envisaged plant are polyester resin, fiber glass, catalyst, and accelerator colors, which have to be imported.

The total investment cost of the project including working capital is estimated at Birr 16.80 million. From the total investment cost the highest share (Birr 11.18 million or 66.54%) is accounted by fixed investment cost followed by initial working capital (Birr 3.79 million or 22.61%) and pre operation cost (Birr 1.82 million or 10.86%). From the total investment cost Birr 6.52 million or 38.83% is required in foreign currency.

The project is financially viable with an internal rate of return (IRR) of 17.26% and a net present value (NPV) of Birr 6.32 million, discounted at 10%.

The project can create employment for 36 persons. The project will create backward linkage with the agriculture and agro processing sectors and forward linkage with the livestock sector and also generates income for the Government in terms of tax revenue and payroll tax.

II. PRODUCT DESCRIPTION & APPLICATION

Fiberglass Reinforced Plastics (FRP) can offer many advantages over other materials. FRP has a higher strength-to-weight ratio than steel. FRP laminate is a light weight structural material that

allows constructing large structures without the use of ribs or supports. Fiberglass duct systems require fewer hangers and supports than equivalent metal or PVC systems. FRP can also be designed to withstand impact, abrasion, cold and heat. Moreover, unlike metal, fiberglass reinforced plastic is inherently non-conductive. Hence, FRP has many advantages over steel and plastics such as PVC and PE.

III. MARKET STUDY AND PLANT CAPACITY

A. MARKET STUDY

1. Past Supply and Present Demand

The country's requirement of fiber reinforced plastic (FRP) tanks, tubes and roof rack is met through import. However, there is no available data which indicates the quantity of the products annually imported. Hence in order to estimate the present demand for FRP tanks, tubes and roof rack the following assumptions are used:

- The majority of large scale water reservoirs and tanks used in the country are made of steel. However, due to the various advantages of FRP tanks about 10% of the demand for metallic reservoirs and tanks will be replaced by FRP tanks;
- Currently, the majority of pipes and tubes are made of plastic materials. However, due to the various advantages of FRP pipes and tubes about 10% of the demand for pipes and tubes will be replaced by FRP pipes and tubes; and
- Since there is no supply data of roof racks the demand for the product is estimated based on current vehicle fleet size and an estimated replacement rate. Moreover, the majority of roof racks used in the country are made of metal. However, due to the various advantages of FRP racks about 10% of the demand for roof racks will be replaced by FRP roof racks.

Metallic water reservoirs and tanks and plastic pipes are manufactured locally and also imported. However, there is no available data that indicates the level of local production of metallic water reservoirs and tanks. Moreover, according to the data source for locally manufactured products i.e. Central Statistical Agency's "Report on Large and Medium Scale Manufacturing and

Electricity Industries Survey”, local production of plastic tubes and pipes during the period 2002 – 2010 ranges from 64,550 pieces in 2004 to 121,121 pieces in 2009.

However, considering the number of local plastic tube manufacturing plants CSA data on local production of plastic pipes is found to be highly under estimated.

Hence, the unsatisfied demand for the products i.e. the demand met through import is considered. Accordingly, import of metallic water reservoirs and tanks and plastic pipes during the period 2002 – 2011 is shown in Table 3.1.

Table 3.1

IMPORT OF WATER RESERVOIRS AND TANKS AND PLASTIC PIPES (TONS)

Year	Metallic Water Reservoirs and Tanks	Plastic Pipes and Tubes
2002	997	1,535
2003	470	619
2004	726	2,003
2005	686	2,112
2006	2,146	2,522
2007	1,936	3,066
2008	1,725	2,459
2009	2,229	4,773
2010	3,712	3,793
2011	3,550	4,618

Source: -Ethiopian Revenue and Customs Authority.

As can be seen from Table 3.1, during the period 2002-2011, import of metallic water reservoirs and tanks and plastic pipes and tubes though fluctuates from year to year, a general growth trend can be observed. For example the average import during the first five years of the data set (2002 – 2006) for metallic water reservoirs and tanks which was 1,005 tons has increased to 2,630

during the next five years (2007-2011) average. During the same period import of plastic pipes and tubes has increased from 1,758 tons to 3,742 tons.

During the period under consideration (2002 – 2011), import of metallic water reservoirs and tanks and plastic pipes and tubes has registered an average annual growth rate of 31% and 32%, respectively.

For estimating the present unsatisfied demand for metallic water reservoirs and tanks and plastic pipes and tubes, it is assumed that the growth rate registered in import of the product during the recent five years (2007-2011) which is 20% and 19%, respectively, will continue at least in the near future.

Accordingly, by taking the average level of import during the recent three years (2009 -2011) as a base and applying a growth rate 20% and 19%, the present (2012) unsatisfied demand for metallic water reservoirs and tanks and plastic pipes and tubes is estimated at 3,796 tons and 5,230 tons respectively.

Moreover, by assuming that 10% of the estimated unsatisfied demand for metallic water reservoirs and tanks and plastic pipes and tubes will be replaced by FRP products the present unsatisfied demand for FRP reservoirs and tanks and pipes and tubes is estimated at 380 tons and 523 tons, respectively.

The demand for roof rack depends in the number of vehicles. The total number of inspected and registered vehicles in the country in 2002 was only 202,462. This number has grown to 319,338 in 2011. During the period 2002 – 2011 the number of operational vehicles has registered an average annual growth rate of 4.68% (See Table 3.2).

Table 3.2
NUMBER OF OPERATIONAL VEHICLES IN ETHIOPIA

Year	Number of Vehicles
2002	202,462
2003	222,000
2004	235,799
2005	249,878
2006	266,196
2007	285,222
2008	303,401
2009	310,012
2010	316,074
2011	319,338

Source: - Road Transport Authority.

For estimating the present number of vehicle in the country, it is assumed that the growth rate registered in the past will continue at least in the near future. Accordingly, by taking the number of inspected and registered vehicles in 2011 as a base and applying a growth rate 5%, the present (2012) number of inspected and registered vehicles is estimated at 335,305.

Moreover assuming that about 20% of the existing vehicles replace their roof racks annually and of which 10% is accounted by FRP roof racks, the present demand for FRP roof racks is estimated at 6,706 pieces.

2. Demand Projection

The major end users of metallic water reservoirs and tanks and plastic pipes and tubes are the manufacturing, agricultural and construction sectors. Hence the demand for the product depends on the performance of the manufacturing, agricultural and construction sectors.

According to the government’s “Growth and Transformation Plan (2011 – 2015)” during the plan period, the industrial sector, which includes the manufacturing and construction sectors, is expected to grow at an average annual growth rate of 20%. However, in order to be conservative a growth rate of 10% which is slightly lower than the anticipated growth rate of GDP during the Growth and Transformation period (11.4%) is used to project the unsatisfied demand for metallic water reservoirs and tanks and plastic pipes and tubes.

The future demand for FRP roof racks depends on the number of vehicles. During the period 2002 – 2011 the number of operational vehicles in the country has registered an average annual growth rate of 4.68%. Hence a 5% growth rate is used to project the demand for FRP roof racks. Accordingly, using the estimated present unsatisfied demand as a base and applying the above growth rates the projected unsatisfied demand for the products is shown in Table 3.3.

Table 3.3
PROJECTED UNSATISFIED DEMAND

Year	FRP Reservoirs and Tanks (ton)	FRP Pipes And Tubes (ton)	FRP Roof Rack (pieces)
2013	418	575	7,041
2014	459	633	7,393
2015	505	696	7,763
2016	556	766	8,151
2017	611	842	8,559
2018	673	926	8,987
2019	740	1,019	9,436
2020	814	1,121	9,908
2021	895	1,233	10,403
2022	985	1,356	10,924
2023	1,083	1,492	11,470
2024	1,191	1,641	12,043
2025	1,311	1,805	12,645

3. Pricing and distribution

Based on year 2011 CIF value of imported reservoir tanks, pipes and tubes and roof racks and considering other costs related to import a factory gate price of Birr 138,246 per ton is recommended for sales revenue projection and financial evaluation.

The products can be distributed through the existing building materials and vehicle spare part distributors.

B. PLANT CAPACITY AND PRODUCTION PROGRAM

1. Plant Capacity

Considering the economic scale of production and available technology relative to the market demand projection the annual total production capacity of the plant is set to be 150 tone of fiber reinforced plastic of different items. The envisaged plant will operate in two shifts sixteen hours per day for three hundred days within a year considering 13 holidays and 52 Sunday per year and assuming that maintenance activities will be performed during off hours and Sunday

2. Production Program

The workers will take some time until they develop a skill in operation and troubleshooting of the production process. Accordingly, the envisaged plant will reach its full capacity operation after 2 years of implementation. During the first and second year it will operate at 75% and 85% of the installed capacity. The annual production program is shown in Table 3.4.

Table 3.4

ANNUAL PRODUCTION PROGRAM

Sr. No.	Description	Production Year		
		1	2	3
1	Capacity utilization rate (%)	75.00	85.00	100.00
2	FRP products (Tons)	112.50	127.50	150.00

IV. MATERIALS AND INPUTS

A. RAW MATERIALS

The direct and auxiliary raw materials required by the plan are polyester resin, fiber glass, and catalyst and accelerator colors. Annual cost of materials is Birr about Birr 14.86 million. All the raw materials have to be imported. The direct and auxiliary raw materials required at full capacity utilization and related cost is shown in Table 4.1.

Table 4.1
ANNUAL RAW MATERIAL REQUIREMENT & COST

Sr. No.	Description	Annual Consumption	UOM	Unit Cost (Birr) /Ton	Cost ("000) Birr		
					LC	FC	Total (Birr)
1	Polyester Resin	150	ton	57,600.00		8,640.00	8,640.00
2	Fiber Glass	60	ton	64,800.00		3,888.00	3,888.00
3	Catalyst	6	ton	54,000.00		324.00	324.00
4	Accelerator -colors	2	ton	45,000.00		67.50	67.50
Total FOB						12,919.50	12,919.50
5	CIF (15%)				1,937.93		1,937.93
Total Raw Material Annual Cost					1,937.93	12,919.50	14,857.43

B. UTILITES

The annual utilities requirement such as electricity as a source of energy and water as cooling and cleaning agents are estimated with their associated cost is shown in Table 4.2.

Table 4.2
ANNUAL UTILITIES CONSUMPTION & COST

Sr. No.	Description	Annual Consumption	UoM	Unit Cost (Birr)	Total Cost (''000 Birr)
1	Electricity	216,000	kWh	0.58	125.28
2	Water	19,200	m ³	10.00	192.00
Total Annual Cost					317.28

V. TECHNOLOGY AND ENGINEERING

A. TECHNOLOGY

1. Production Process

The most popular method for manufacture of large and complex items is hand layup process. It requires minimum equipment and inexpensive moulds. Moulds are made of reinforced plastics, plaster of Paris, wood, etc. only one mould, male or female is used and the articles produced have finish on the side that comes in contact with the mould. Resins used are of polyester and epoxy. The molding operation is as follows.

- Application of release agent,
- Gel coat,
- The layup operation,
- Curing and releasing the mould,
- Trimming, and
- Painting.

2. Environmental Impact

The envisaged plant is a manufacturing plant with no chemical or any hazardous waste to the surrounding environment and process scrapes and wastes will be recycled so that there will not be additional investment for environmental protection

B. ENGINNERING**1. Machinery and Equipment**

Total cost of machinery and equipment is Birr 7.5 million. The list of direct and auxiliary machinery, tools and equipments required for the plant and their estimated cost is shown in Table 5.1.

Table 5.1**LIST OF MACHINERIES, TOOLS ANDEQUIPMENT &COST**

Sr. No.	Description	Qty .	Unit Cost USD (FOB)	UOM	Unit Cost (Birr)	Total Cost (`000 Birr)		
						LC	FC	Total (Birr)
1	Equipment	1.00	15,000.00	set	270,000.00		270.00	270.00
2	Lab equipment	1.00	5,000.00	set	90,000.00		90.00	90.00
3	Steel	1.00	54,000.00	set	972,000.00		972.00	972.00
4	Fans	1.00	10,000.00	PCS	180,000.00		180.00	180.00
5	Molds	5.00	25,000.00	set	450,000.00		2,250.00	2,250.00
6	Lathe	1.00	39,450.00	PCS	710,100.00		710.10	710.10
7	Hydraulic Press Machine	1.00	40,000.00	set	720,000.00		720.00	720.00
8	Welding	1.00	20,000.00	set	360,000.00		360.00	360.00
9	Bench Grinder	1.00	1,500.00	set	27,000.00		27.00	27.00
10	Compressor	1.00	300.00	set	5,400.00		5.40	5.40
11	Miscellaneous	1.00	35,000.00	set	630,000.00		630.00	630.00
12	Spare parts (5%)						310.73	310.73
Total Fob Price							6,525.23	6,525.23
13	CIF(15%)					978.78		978.78
Grand Total Machinery Cost						978.78	6,525.23	7,504.01

2. Land, Building and Civil Works

The envisaged plant requires total land area of 1,000 meter square, out of which built up area is 500 meter square. At a rate of Birr 5,000 per meter square the total cost of building and civil work is estimated at Birr 2.5 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 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
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 266,000 of which 10% or Birr 26,600 will be paid in advance. The remaining Birr 239,400 will be paid in equal installments with in 28 years i.e. Birr 8,550 annually.

VI. HUMANRESOURCE AND TRAINING REQUIREMENTS**A. HUMANRESOURCE REQUIREMENT**

The project requires a total of 36 workers. Annual labor cost is estimated at Birr 799,200. The list of direct and indirect human resource requirement and their monthly and annual cost is shown in Table 6.1.

B. TRAINING REQUIREMENT

Due to the less complexity of the production process, individual operators will be trained during machinery and technology supply together with the transfer of skills and knowledge that will be held during factory with an estimated training cost of Birr 80,000 so as to minimize the expense of the investment.

Table 6.1
HUMAN RESOURCE REQUIREMENT AND LABOR COST

Sr. No.	Description	Reqd. No.	Monthly Salary (Birr)	Annual salary (`000 Birr)
1	Plant manager	1	6,000.00	72.0
2	Secretary	1	1,500.00	18.0
3	Administration and finance	1	4,500.00	54.0
4	Accountant	1	3,000.00	36.0
5	Mechanic	1	2,200.00	26.4
6	Electrician	1	2,200.00	26.4
7	Operators	16	1,400.00	268.8
8	Production Foreman	1	3,000.00	36.0
9	Clerk	1	800.00	9.6
10	Cashier	1	1,000.00	12.0
11	Assistant operator	6	700.00	50.4
12	Store Keeper	1	1,400.00	16.8
13	Time Keeper	1	1,200.00	14.4
14	Guards	3	700.00	25.2
Sub-total		36	29,600.00	666.0
18	Employment benefits and allowances 20%		5,920.00	133.2
Total Annual Labor Cost (Direct +Indirect)				799.2

VII. FINANCIAL ANALYSIS

The financial analysis of the fiberglass reinforced plastics 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
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 16.80 million (see Table 7.1). From the total investment cost the highest share (Birr 11.18 million or 66.54%) is accounted by fixed investment cost followed by initial working capital (Birr 3.79 million or 22.61%) and pre operation cost (Birr 1.82 million or 10.86%). From the total investment cost Birr 6.52 million or 38.83% 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	26.60		26.60	0.16
1.2	Building and civil work	2,500.00		2,500.00	14.88
1.3	Machinery and equipment	978.78	6,525.23	7,504.01	44.66
1.4	Vehicles	900.00		900.00	5.36
1.5	Office furniture and equipment	250.00		250.00	1.49
	Sub total	4,655.38	6,525.23	11,180.61	66.54
2	Pre operating cost *				
2.1	Pre operating cost	725.20		725.20	4.32
2.2	Interest during construction	1,099.30		1,099.30	6.54
	Sub total	1,824.50		1,824.50	10.86
3	Working capital **	3,798.50		3,798.50	22.61
	Grand Total	10,278.38	6,525.23	16,803.61	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 5.05 million. However, only the initial working capital of Birr 3.79 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 19.90 million (see Table 7.2). The cost of raw material account for 74.63% of the production cost. The other major components of the production cost are depreciation, financial cost and labor which account for 9.80%, 5.31% and 3.35%, respectively. The remaining 6.91% is the share of utility, labor overhead, repair and maintenance, 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	14,857.43	74.63
Utilities	317.28	1.59
Maintenance and repair	375.20	1.88
Labor direct	666.00	3.35
Labor overheads	133.20	0.67
Administration Costs	200.00	1.00
Land lease cost	-	-
Cost of marketing and distribution	350.00	1.76
Total Operating Costs	16,899.11	84.89
Depreciation	1,950.84	9.80
Cost of Finance	1,058.08	5.31
Total Production Cost	19,908.03	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 840 thousand to Birr 2.59 million during the life of the project. Moreover, at the end of the project life the accumulated net cash

flow amounts to Birr 20.84 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.

$$\text{Break -Even Sales Value} = \frac{\text{Fixed Cost} + \text{Financial Cost}}{\text{Variable Margin ratio (\%)}} = \text{Birr } 11,392,980$$

$$\text{Break- Even Capacity utilization} = \frac{\text{Break- even Sales Value}}{\text{Sales revenue}} \times 100 = 55\%$$

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 7 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 17.26% 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 6.32 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 36 persons. The project will generate Birr 5.73 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 construction sub sectors and also generate 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	11,143	12,629	14,857	14,857	14,857	14,857	14,857	14,857	14,857	14,857
Utilities	238	270	317	317	317	317	317	317	317	317
Maintenance and repair	281	319	375	375	375	375	375	375	375	375
Labour direct	500	566	666	666	666	666	666	666	666	666
Labour overheads	100	113	133	133	133	133	133	133	133	133
Administration Costs	150	170	200	200	200	200	200	200	200	200
Land lease cost	0	0	0	0	9	9	9	9	9	9
Cost of marketing and distribution	350	350	350	350	350	350	350	350	350	350
Total Operating Costs	12,762	14,417	16,899	16,899	16,908	16,908	16,908	16,908	16,908	16,908
Depreciation	1,951	1,951	1,951	1,951	1,951	125	125	125	125	125
Cost of Finance	0	1,209	1,058	907	756	605	453	302	151	0
Total Production Cost	14,713	17,577	19,908	19,757	19,614	17,637	17,486	17,335	17,184	17,033

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	15,553	18,663	20,737	20,737	20,737	20,737	20,737	20,737	20,737	20,737
Less variable costs	12,412	14,067	16,549	16,549	16,549	16,549	16,549	16,549	16,549	16,549
VARIABLE MARGIN	3,141	4,596	4,188	4,188	4,188	4,188	4,188	4,188	4,188	4,188
in % of sales revenue	20.20	24.63	20.20	20.20	20.20	20.20	20.20	20.20	20.20	20.20
Less fixed costs	2,301	2,301	2,301	2,301	2,309	484	484	484	484	484
OPERATIONAL MARGIN	840	2,295	1,887	1,887	1,878	3,704	3,704	3,704	3,704	3,704
in % of sales revenue	5.40	12.30	9.10	9.10	9.06	17.86	17.86	17.86	17.86	17.86
Financial costs		1,209	1,058	907	756	605	453	302	151	0
GROSS PROFIT	840	1,086	829	980	1,123	3,100	3,251	3,402	3,553	3,704
in % of sales revenue	5.40	5.82	4.00	4.73	5.41	14.95	15.68	16.41	17.13	17.86
Income (corporate) tax	0	0	0	294	337	930	975	1,021	1,066	1,111
NET PROFIT	840	1,086	829	686	786	2,170	2,276	2,381	2,487	2,593
in % of sales revenue	5.40	5.82	4.00	3.31	3.79	10.46	10.97	11.48	11.99	12.50

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	11,906	20,516	18,672	20,750	20,737	20,737	20,737	20,737	20,737	20,737	20,737	7,682
Inflow funds	11,906	4,963	9	13	0	0	0	0	0	0	0	0
Inflow operation	0	15,553	18,663	20,737	20,737	20,737	20,737	20,737	20,737	20,737	20,737	0
Other income	0	0	0	0	0	0	0	0	0	0	0	7,682
TOTAL CASH OUTFLOW	11,906	17,725	17,649	20,236	19,612	19,513	19,954	19,848	19,742	19,636	18,019	0
Increase in fixed assets	11,906	0	0	0	0	0	0	0	0	0	0	0
Increase in current assets	0	3,864	511	767	0	1	0	0	0	0	0	0
Operating costs	0	12,412	14,067	16,549	16,549	16,558	16,558	16,558	16,558	16,558	16,558	0
Marketing and Distribution cost	0	350	350	350	350	350	350	350	350	350	350	0
Income tax	0	0	0	0	294	337	930	975	1,021	1,066	1,111	0
Financial costs	0	1,099	1,209	1,058	907	756	605	453	302	151	0	0
Loan repayment	0	0	1,512	1,512	1,512	1,512	1,512	1,512	1,512	1,512	0	0
SURPLUS (DEFICIT)	0	2,791	1,023	514	1,125	1,224	783	889	995	1,101	2,718	7,682
CUMULATIVE CASH BALANCE	0	2,791	3,814	4,328	5,454	6,678	7,462	8,351	9,345	10,446	13,164	20,846

Appendix 7.A.5DISCOUNTED 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	15,553	18,663	20,737	20,737	20,737	20,737	20,737	20,737	20,737	20,737	7,682
Inflow operation	0	15,553	18,663	20,737	20,737	20,737	20,737	20,737	20,737	20,737	20,737	0
Other income	0	0	0	0	0	0	0	0	0	0	0	7,682
TOTAL CASH OUTFLOW	15,704	13,264	15,171	16,899	17,194	17,244	17,838	17,883	17,928	17,974	18,019	0
Increase in fixed assets	11,906	0	0	0	0	0	0	0	0	0	0	0
Increase in net working capital	3,798	503	754	0	1	0	0	0	0	0	0	0
Operating costs	0	12,412	14,067	16,549	16,549	16,558	16,558	16,558	16,558	16,558	16,558	0
Marketing and Distribution cost	0	350	350	350	350	350	350	350	350	350	350	0
Income (corporate) tax		0	0	0	294	337	930	975	1,021	1,066	1,111	0
NET CASH FLOW	-15,704	2,289	3,492	3,838	3,543	3,493	2,899	2,854	2,809	2,763	2,718	7,682
CUMULATIVE NET CASH FLOW	-15,704	13,416	-9,923	-6,085	-2,542	950	3,850	6,704	9,512	12,276	14,994	22,675
Net present value	-15,704	2,081	2,886	2,883	2,420	2,169	1,637	1,465	1,310	1,172	1,048	2,962
Cumulative net present value	-15,704	13,624	10,737	-7,854	-5,434	-3,266	-1,629	-164	1,146	2,318	3,366	6,327

NET PRESENT VALUE 6,327
INTERNAL RATE OF
RETURN 17.26%
NORMAL PAYBACK 7 years

