

**86. PROFILE ON THE PRODUCTION OF RIGID  
PLASTIC PIPES & FITTINGS**

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## **I. SUMMARY**

This profile envisages the establishment of a plant for the production of the rigid plastic pipes & fittings with a capacity of 9,500 tons per annum. Rigid plastic pipes & fittings are used to transport liquids or liquid-solid mixtures from one point to another.

The demand for rigid plastic pipes & fittings is through domestic production and import. The present (2012) demand for rigid plastic pipes & fittings is estimated at 9,535 tons. The demand for rigid plastic pipes & fittings is projected to reach 15,356 tons and 24,731 tons by the year 2017 and 2022, respectively.

The principal raw materials required are PVC resin, stearic acid, stabilizer, calcium stearate, filler, and master batch which have all to be imported.

The total investment cost of the project including working capital is estimated at Birr 150.10 million. From the total investment cost, the highest share (Birr 103.22 million or 68.77%) is accounted by initial working capital followed by fixed investment cost (35.90 million or 23.91%) and pre operation cost (Birr 10.98 million or 7.32%). From the total investment cost, Birr 23.62 million or 15.74% is required in foreign currency.

The project is financially viable with an internal rate of return (IRR) of 20.95% and a net present value (NPV) of Birr 108.23 million, discounted at 10%.

The project can create employment for 59 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 mining and agricultural sectors and chemical manufacturing sub sector and also generates other income for the Government.

## **II. PRODUCT DESCRIPTION AND APPLICATION**

Rigid plastic pipes & fittings are used to transport liquids or liquid-solid mixtures from one point to another. Rigid plastic pipes & fittings are widely used in chemical plants, mines and agricultural activities. Water, steam and gas pipes are familiar in homes and industrial establishments. Large systems of pipes include those used in municipal water supplies and for

sewerage disposal. Therefore, the local demand for the product is influenced largely by the expansion of modern houses, increase in municipal water supply and sewerage disposal.

### III. MARKET STUDY AND PLANT CAPACITY

#### A. MARKET STUDY

##### 1. Past Supply and Present Demand

The demand for rigid plastic pipes & fittings is met largely through import and partially through local production. According to the data obtained from the Ethiopian Revenues & customs Authority the types of rigid plastic pipes imported to the country are mainly made of polymers of ethylene, propylene, vinyl-chloride and other plastics. A summary on the import of rigid plastic pipes and fittings in the past 10 years is shown in Table 3.1

**Table 3.1**  
**IMPORT OF RIGID PLASTIC PIPES & FITTINGS (TONE)**

Year	Pipes & Tubes		Pipe Fittings		Total	
	Quantity (Tons)	Value ( `000 Birr)	Quantity (Tons)	Value ( `000)	Quantity (Tons)	Value ( `000)
2002	466	5,499	151	3,969	617	9,468
2003	1,672	18,856	360	9,270	2,032	28,126
2004	1,121	18,154	567	10,397	1,688	28,551
2005	2,035	26,569	1,051	29,498	3,086	56,067
2006	1,687	27,801	871	26,694	2,558	54,495
2007	1,333	40,448	944	30,084	2,277	70,532
2008	12,867	344,025	1,547	51,360	14,414	395,385
2009	3,219	133,622	1,699	49,380	4,918	183,002
2010	1,875	114,830	4,423	160,879	6,298	275,709
2011	4,129	214,941	4,305	219,260	8,434	434,201

*Source: - Ethiopian Revenues & Customs Authority.*

As could be seen from Table 3.1, import data of rigid plastic pipes & fittings shows a general increasing trend, although some fluctuations are observed in certain years. During the initial years of the data set i.e. 2002-2004 the yearly average level of import were 1,445 tons. During the years 2005-2007 the yearly average level of import reached at 2,640 tons, which is 82% compared to the previous years average. Exceptionally very high volume of import is registered during year 2008, which amount at 14,414 tons. The quantity imported in 2008 alone is greater than the sum of the previous six years. This might have happened due to the implementation of special projects which required the product at specific period of time.

By the year 2009, the quantity imported was 4, 918, which is much less compared to the exceptional figure of 2008 but greater than all the years preceding it. Imported quantity during the period 2010 and 2011 also increased to 6,298 tons and 8,434 tons, respectively. This means that imports of 2010 and 2011 have grown by 28% and 34% compared to their respective preceding years.

To estimate the present demand the past growth trend of import has been taken by excluding the exceptional high figure of year 2008 and low figure of year 2001. Hence, the yearly average growth during the past eight years was found to be about 27%. To be conservative the current unsatisfied demand for rigid plastic pipes and fittings is set at 9,535 tons by applying 13% (which is half of the past trend) growth rate on the year 2011 volume of import.

From the Table 3.1 it is found that of the total rigid plastic pipes and fittings imported, on the average the share of pipes and fittings is about 67% and 33%, respectively.

## **2. Demand Projection**

To estimate the future unsatisfied demand the trend in the imported quantity in the past ten years and the future development of the construction, urban and irrigation development are taken in to account. As described above, the trend in the growth of import was very high. In addition, a number of building construction and urban infrastructure developments are planned to be carried out by the government as well as the private sector. To ensure food security irrigation development is one of the priorities accorded by the government. Hence, as a result of the various development activities the demand for rigid plastic pipes and fittings will grow substantially. However, to be conservative a 10% annual growth rate is applied in forecasting the

unsatisfied future demand. The share of pipes and fittings is assumed 67% and 33% based on the historical import data (see Table 3.2).

**Table 3.2**

**PROJECTED UNSATISFIED DEMAND (TONS)**

<b>Year</b>	<b>Pipes</b>	<b>Fittings</b>	<b>Total</b>
2013	7,027	3,461	10,488
2014	7,730	3,807	11,537
2015	8,503	4,188	12,691
2016	9,353	4,607	13,960
2017	10,289	5,067	15,356
2018	11,318	5,574	16,892
2019	12,450	6,131	18,581
2020	13,694	6,745	20,439
2021	15,064	7,419	22,483
2022	16,570	8,161	24,731

The unsatisfied demand for pipes will increase from 7,027 tons in the year 2013 to 11,318 tons and 16,570 tons by the year 2018 and 2022, respectively. Similarly, the demand for fittings will increase from 3,461 tons in the year 2013 to 5,574 tons and 8,161 tons by the year 2018 and 2022, respectively

### **3. Pricing and Distribution**

The price of plastic pipes and fittings varies greatly depending upon the specific raw material used, diameter, thickness and the like. For the purpose of this project a factory gate price of Birr 52,000 per tone of pipes and Birr 32,000 per tone of fittings is recommended based on the average CIF import data of the past two recent years.

The project can directly sell to bulk purchasers such as construction companies, municipalities and irrigation development projects. For small quantity orders it can use the existing building materials whole sale and retail enterprises throughout the country.

## B. PLANT CAPACITY AND PRODUCTION PROGRAM

### 1. Plant Capacity

Considering the economic scale, production management, the market demand projection and the proportional consumption of pipe and fittings the annual total production capacity of the pipe and fitting plant is set to be 9500 ton per annum. 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 manufacturing process pipes and fitting includes involves arrangement of tools and services so the manpower in production will take a considerable time until they develop a skill in operation and troubleshooting of the production process so the production program of pipes and fittings for the envisaged plant for three years after its establishment and commissioned is shown below

**Table 3.3**

#### **PRODUCTION PROGRAM**

Sr. No.	Description	Production Year		
		1	2	4
1	Capacity utilization rate (%)	75	85	100
2	pipes ( ton)	6,000	6,800	8,000
3	Fittings( ton)	1,125	1,275	1,500
	<b>Total</b>	7,125	8,075	9,500

#### IV. MATERIALS AND INPUTS

##### A. RAW MATERIALS

PVC resin, stearic acid, stabilizer, calcium stearate and master batch are the raw materials required, which have to be imported. The quantity required and corresponding cost at full capacity operation are given in Table 4.1.

**Table 4.1**

#### **RAW MATERIAL REQUIREMENT & COST**

Sr. No.	Description	Annual Consumption	UOM	Unit Cost (Birr/Ton)	Cost ( `000 Birr )		
					LC	FC	Total
1	PVC Resin	8,738	ton	38,400.00		335,539.20	335,539.20
2	Stearic Acid	139	ton	16,800.00		2,327.50	2,327.50
3	Stabilizer	218	ton	24,000.00		5,225.00	5,225.00
4	Calcium Stearate	69	ton	38,400.00		2,660.00	2,660.00
5	Filler	752	ton	11,520.00		8,664.00	8,664.00
6	master batch	59	ton	57,600.00		3,420.00	3,420.00
<b>Total FOB</b>						<b>357,835.70</b>	<b>357,835.70</b>
7	CIF (15%)				53,675.36		53,675.36
<b>Total Raw Material Annual Cost</b>					<b>53,675.36</b>	<b>357,835.70</b>	<b>411,511.06</b>

##### B. UTILITIES

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



**Table 4.2****ANNUAL UTILITIES CONSUMPTION&COST**

<b>Sr. No.</b>	<b>Description</b>	<b>Annual Consumption</b>	<b>UOM</b>	<b>Unit Cost ( Birr)</b>	<b>Cost ( `000 Birr)</b>
1	Electricity	3,440,000	kWh	0.58	1,995
2	Water	190,000	m <sup>3</sup>	10.00	1,900
<b>Total Annual Cost</b>					<b>3,895</b>

**V. TECHNOLOGY AND ENGINEERING****A. TECHNOLOGY****1. Production Process**

The production of rigid PVC pipes consists of plasticizing and homogenizing PVC compound and melting through extruder. This hot molten PVC compound is extruded through a circular die where the size of pipe will be governed. So using different sizes of dies different sizes of pipes will be manufactured and will pass through a vacuum sizing and cooling tank where the dimension of the pipe can be accurately set to standard size and finally cut required length using motorized moving saw carriage during production.

Fittings are manufactured by using plastic mould dies depending on the required type of fitting which are mounted on the injection mould machine and will be charged with molten PVC, where as fittings such as elbows and T- joints are manufactured using plastic mould machine in which molten PVC is charged in to the die and compressed air will be injected to get the desired product

**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 crashed and recycled or sold to surrounding market for different application 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 27.16 million out of which Birr 23.62 million is required in foreign currency. 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 MACHINERY & EQUIPMENTS AND COST**

Sr. No.	Description	Qty	Unit Cost USD (FOB)	Unit Cost ( Birr)	Total Cost ( `000 Birr )		
					LC	FC	Total ( Birr)
1	160 MM PVC pipe extruder machine with complete line set	1	250,000	4,500,000		4,500	4,500
2	65 MM PVC pipe extruder machine with complete line set	1	120,000	2,160,000		2,160	2,160
3	high speed mixer	1.	212,500	3,825,000		3,825	3,825
4	Injection moulding machine	2	175,000	3,150,000		6,300	6,300
5	Extrusion dies ( pipes )	1	50,000	900,000		900	900
6	Injection Molds ( fittings )	1	40,000	720,000		720	720
7	lathe	2	40,800	734,400		1,469	1,469
8	hydraulic press machine	1	39,450	710,100		710	710
9	welding	1	38,850	699,300		699	699
10	bench grinder	1	40,000	720,000		720	720
11	compressor	1	55,000	990,000		990	990
12	Tools of different type	1	35,000	630,000		630	630
Total Fob Price						23,623	23,623
13	CIF (15%)				<b>3,543</b>	0.00	3,543
<b>Grand Total Cost</b>					<b>3,543</b>	<b>23,623</b>	<b>27,166</b>

## **2. Land, Building and Civil Works**

The envisaged plant requires total land area of 3,000 meter square, out of which built up area is 1,500 meter square. At the rate of Birr 5,000 per m<sup>2</sup>, the total cost of building and civil work is estimated at Birr 7.5 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 m<sup>2</sup>, 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 m<sup>2</sup>, 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 m<sup>2</sup>. 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 m<sup>2</sup>. 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 m<sup>2</sup> (see Table 5.2).

**Table 5.2****NEW LAND LEASE FLOOR PRICE FOR PLOTS IN ADDIS ABABA**

<b>Zone</b>	<b>Level</b>	<b>Floor Price/m<sup>2</sup></b>
Central Market District	1 <sup>st</sup>	1686
	2 <sup>nd</sup>	1535
	3 <sup>rd</sup>	1323
	4 <sup>th</sup>	1085
	5 <sup>th</sup>	894
Transitional zone	1 <sup>st</sup>	1035
	2 <sup>nd</sup>	935
	3 <sup>rd</sup>	809
	4 <sup>th</sup>	685
	5 <sup>th</sup>	555
Expansion zone	1 <sup>st</sup>	355
	2 <sup>nd</sup>	299
	3 <sup>rd</sup>	217
	4 <sup>th</sup>	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 m<sup>2</sup> 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**

<b>Scored Point</b>	<b>Grace Period</b>	<b>Payment Completion Period</b>	<b>Down Payment</b>
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 m<sup>2</sup> 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. HUMAN RESOURCE AND TRAINING REQUIREMENTS**

### **A. HUMAN RESOURCE REQUIREMENT**

The total human resource requirement of the project is 59 persons. Annual cost of labor is estimated at Birr 1.33 million. The list of direct and indirect labor requirement and their monthly and annual cost is shown in Table 6.1.

**Table 6.1****HUMAN RESOURCE REQUIREMENT & LABOR COST**

<b>Sr. No.</b>	<b>Description</b>	<b>Reqd. No.</b>	<b>Monthly Salary ( Birr)</b>	<b>Annual Salary ( `000 Birr)</b>
1	Plant manager	1	10,000.00	120.0
2	Secretary	1	2,500.00	30.0
3	Administration and finance	1	6,000.00	72.0
4	Accountant	1	3,000.00	36.0
5	Mechanic	2	2,200.00	52.8
6	Electrician	2	2,200.00	52.8
7	operators	18	1,400.00	302.4
8	production foreman	2	3,000.00	72.0
9	senior machinist	2	2,500.00	60.0
10	junior machinist	2	1,800.00	43.2
11	Clerk	1	800.00	9.6
12	Cashier	1	1,000.00	12.0
13	Assistant operator	18	700.00	151.2
14	Quality inspector	2	1,600.00	38.4
15	store keeper	1	1,400.00	16.8
16	time keeper	1	1,200.00	14.4
17	Guards	3	700.00	25.2
<b>Total</b>		<b>59</b>	<b>42,000.00</b>	<b>1,108.8</b>
18	Employment benefits and allowances 20%		8,400.00	221.8
<b>Total Annual Labor Cost (Direct +Indirect)</b>				<b>1,330.6</b>

**B. TRAINING REQUIREMENT**

Since it is a manufacturing process, individual operators will be trained during machinery commissioning so that the operators and mechanics will be hired two months before the project implementation .In addition special training about the good practice of injection moulds maintenance should be given to the senior and junior machinists from the technology supplier during commissioning and the estimated training cost is Birr 133,500.

## VII. FINANCIAL ANALYSIS

The financial analysis of the rigid plastic pipes 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	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 150.10 million (see Table 7.1). From the total investment cost, the highest share (Birr 103.22 million or 68.77%) is accounted by initial working capital followed by fixed investment cost (35.90 million or 23.91%) and pre operation cost (Birr 10.98 million or 7.32%). From the total investment cost, Birr 23.62 million or 15.74% is required in foreign currency.



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

Sr. No	Cost Items	Local Cost	Foreign Cost	Total Cost	% Share
<b>1</b>	<b>Fixed investment</b>				
1.1	Land Lease	79.80		79.80	0.05
1.2	Building and civil work	7,500.00		7,500.00	5.00
1.3	Machinery and equipment	3,543.48	23,623.20	27,166.68	18.10
1.4	Vehicles	900.00		900.00	0.60
1.5	Office furniture and equipment	250.00		250.00	0.17
	<b>Sub total</b>	<b>12,273.28</b>	<b>23,623.20</b>	<b>35,896.48</b>	<b>23.91</b>
<b>2</b>	<b>Pre operating cost *</b>				
2.1	Pre operating cost	1,165.00		1,165.00	0.78
2.2	Interest during construction	9,819.91		9,819.91	6.54
	<b>Sub total</b>	<b>10,984.91</b>		<b>10,984.91</b>	<b>7.32</b>
<b>3</b>	<b>Working capital **</b>	<b>103,222.97</b>		<b>103,222.97</b>	<b>68.77</b>
	<b>Grand Total</b>	<b>126,481.16</b>	<b>23,623.20</b>	<b>150,104.36</b>	<b>100</b>

\* *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 137.76 million. However, only the initial working capital of Birr 103.22 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 434.47 million (see Table 7.2). The cost of raw material account for 94.72% of the production cost. The other major components of the production cost are financial cost, depreciation, utility, and repair and maintenance, which account for 2.18%, 1.42%, 0.90% and 0.31%, respectively. The remaining 0.47% is the share of labor, marketing and distribution, and labor overhead and administration cost. For detail production cost see Appendix 7.A.2.

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

<b>Items</b>	<b>Cost (000 Birr)</b>	<b>%</b>
Raw Material and Inputs	411,511.00	94.72
Utilities	3,895.00	0.90
Maintenance and repair	1,358.00	0.31
Labour direct	1,109.00	0.26
Labour overheads	222.00	0.05
Administration Costs	250.00	0.06
Land lease cost	-	-
Cost of marketing and distribution	500.00	0.12
<b>Total Operating Costs</b>	<b>418,845.00</b>	<b>96.40</b>
Depreciation	6,171.34	1.42
Cost of Finance	9,451.66	2.18
<b>Total Production Cost</b>	<b>434,468.00</b>	<b>100</b>

**C. FINANCIAL EVALUATION****1. Profitability**

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Based on the projected profit and loss statement, the project will generate a profit throughout its operation life. Annual net profit after tax will grow from Birr 21.62 million to Birr 31.36 million during the life of the project. Moreover, at the end of the project life the accumulated net cash flow amounts to Birr 312.05 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.

$$\text{Break- Even Sales Value} = \frac{\text{Fixed Cost} + \text{Financial Cost}}{\text{Variable Margin ratio (\%)}} = \text{Birr } 194,880,000$$

$$\text{Break -Even Capacity utilization} = \frac{\text{Break -even Sales Value}}{\text{Sales revenue}} \times 100 = 14.61 \%$$

## 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 6 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 20.95% 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 108.23 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 59 persons. The project will generate Birr 82.08 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 mines and agricultural sectors and chemical manufacturing sub sector and also generates other income for the Government.

**Appendix 7.A**

**FINANCIAL ANALYSES SUPPORTING TABLES**



**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	348,000	394,400	464,000	464,000	464,000	464,000	464,000	464,000	464,000	464,000
Less variable costs	313,759	355,593	418,345	418,345	418,345	418,345	418,345	418,345	418,345	418,345
<b>VARIABLE MARGIN</b>	<b>34,241</b>	<b>38,807</b>	<b>45,655</b>	<b>45,655</b>	<b>45,655</b>	<b>45,655</b>	<b>45,655</b>	<b>45,655</b>	<b>45,655</b>	<b>45,655</b>
in % of sales revenue	9.84	9.84	9.84	9.84	9.84	9.84	9.84	9.84	9.84	9.84
Less fixed costs	6,671	6,671	6,671	6,671	6,697	851	851	851	851	851
<b>OPERATIONAL MARGIN</b>	<b>27,570</b>	<b>32,135</b>	<b>38,984</b>	<b>38,984</b>	<b>38,958</b>	<b>44,804</b>	<b>44,804</b>	<b>44,804</b>	<b>44,804</b>	<b>44,804</b>
in % of sales revenue	7.92	8.15	8.40	8.40	8.40	9.66	9.66	9.66	9.66	9.66
Financial costs		10,802	9,452	8,101	6,751	5,401	4,051	2,700	1,350	0
<b>GROSS PROFIT</b>	<b>27,570</b>	<b>21,334</b>	<b>29,532</b>	<b>30,882</b>	<b>32,207</b>	<b>39,403</b>	<b>40,754</b>	<b>42,104</b>	<b>43,454</b>	<b>44,804</b>
in % of sales revenue	7.92	5.41	6.36	6.66	6.94	8.49	8.78	9.07	9.37	9.66
Income (corporate) tax	0	0	0	9,265	9,662	11,821	12,226	12,631	13,036	13,441
<b>NET PROFIT</b>	<b>27,570</b>	<b>21,334</b>	<b>29,532</b>	<b>21,618</b>	<b>22,545</b>	<b>27,582</b>	<b>28,528</b>	<b>29,473</b>	<b>30,418</b>	<b>31,363</b>
in % of sales revenue	7.92	5.41	6.36	4.66	4.86	5.94	6.15	6.35	6.56	6.76

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

<b>Item</b>	<b>Year 1</b>	<b>Year 2</b>	<b>Year 3</b>	<b>Year 4</b>	<b>Year 5</b>	<b>Year 6</b>	<b>Year 7</b>	<b>Year 8</b>	<b>Year 9</b>	<b>Year 10</b>	<b>Year 11</b>	<b>Scrap</b>
<b>TOTAL CASH INFLOW</b>	<b>37,061</b>	<b>461,197</b>	<b>394,421</b>	<b>464,031</b>	<b>464,000</b>	<b>464,000</b>	<b>464,000</b>	<b>464,000</b>	<b>464,000</b>	<b>464,000</b>	<b>464,000</b>	<b>152,019</b>
Inflow funds	37,061	113,197	21	31	0	0	0	0	0	0	0	0
Inflow operation	0	348,000	394,400	464,000	464,000	464,000	464,000	464,000	464,000	464,000	464,000	0
Other income	0	0	0	0	0	0	0	0	0	0	0	152,019
<b>TOTAL CASH OUTFLOW</b>	<b>37,061</b>	<b>427,456</b>	<b>394,176</b>	<b>462,466</b>	<b>449,713</b>	<b>448,789</b>	<b>449,595</b>	<b>448,650</b>	<b>447,705</b>	<b>446,759</b>	<b>432,312</b>	<b>0</b>
Increase in fixed assets	37,061	0	0	0	0	0	0	0	0	0	0	0
Increase in current assets	0	103,377	13,778	20,667	0	2	0	0	0	0	0	0
Operating costs	0	313,759	355,593	418,345	418,345	418,371	418,371	418,371	418,371	418,371	418,371	0
Marketing and Distribution cost	0	500	500	500	500	500	500	500	500	500	500	0
Income tax	0	0	0	0	9,265	9,662	11,821	12,226	12,631	13,036	13,441	0
Financial costs	0	9,820	10,802	9,452	8,101	6,751	5,401	4,051	2,700	1,350	0	0
Loan repayment	0	0	13,502	13,502	13,502	13,502	13,502	13,502	13,502	13,502	0	0
<b>SURPLUS (DEFICIT)</b>	<b>0</b>	<b>33,741</b>	<b>245</b>	<b>1,565</b>	<b>14,287</b>	<b>15,211</b>	<b>14,405</b>	<b>15,350</b>	<b>16,295</b>	<b>17,241</b>	<b>31,688</b>	<b>152,019</b>
<b>CUMULATIVE CASH BALANCE</b>	<b>0</b>	<b>33,741</b>	<b>33,986</b>	<b>35,551</b>	<b>49,837</b>	<b>65,049</b>	<b>79,454</b>	<b>94,804</b>	<b>111,099</b>	<b>128,340</b>	<b>160,028</b>	<b>312,047</b>



