

**64. PROFILE ON THE PRODUCTION OF INK
(PRINTING)**

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I. SUMMARY

This profile envisages the establishment of a plant for the production of printing ink with a capacity of 1,000 tons per annum. The product is used for printing books, newspaper, magazine etc,

The country's requirement of printing ink is met through import. The present (2012) demand for printing ink is estimated at 522 tons. The demand for the product is projected reach to 1,030 tons and 1,816 tons by the year 2018 and year 2023, respectively.

The principal raw materials required are pigments, binders, solvents and additives which have to be imported.

The total investment cost of the project including working capital is estimated at Birr 40.09 million. From the total investment cost, the highest share (Birr 26.68 million or 66.54%) is accounted by initial working capital followed by fixed investment cost (Birr 10.10 million or 25.37%) and pre operation cost (Birr 3.24 million or 8.09%). From the total investment cost Birr 2.40 million or 5.99% is required in foreign currency.

The project is financially viable with an internal rate of return (IRR) of 28.88% and a net present value (NPV) of Birr 74.72 million, discounted at 10%.

The project can create employment for 45 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 printing and publishing sector and also generates income for the Government in terms of tax revenue and payroll tax.

II. PRODUCT DESCRIPTION AND APPLICATION

Ink is an organic or inorganic pigment or dye dissolved or suspended in a solvent. However, chemically, it is viewed as a colloidal system of fine pigment particles, colored or uncoloured, dispersed in an aqueous or organic solvent.

Modern inks are complex formulations. Along with the pigment, they also contain some additional ingredients collectively known as 'vehicle' in varying levels. These exemplify pH modifiers, humectants to retard premature drying, polymeric resins to impart binding and allied properties, defoamer/antifoaming agents to regulate foam efficiency, wetting agents such as surfactants to control surface properties, biocides to inhibit the fungal and bacterial growth that lead to fouling, and thickeners or rheology modifiers to control ink application.

Today's inks comprise two classes: printing and writing inks. Printing ink is further broken down into two subclasses: ink for conventional printing, in which a mechanical plate comes in contact with or transfers an image to the paper or object being printed on; and ink for digital nonimpact printing, which includes ink-jet and electro-photographic technologies. Over 90 per cent of inks are printing inks, in which color is imparted by pigments rather than the dyes used in writing inks. Color printing inks primarily consist of linseed oil, soybean oil, or a heavy petroleum distillate as the solvent (called the vehicle) combined with organic pigments made up of salts of nitrogen-containing compounds (dyes), such as yellow lake, peacock blue, phthalocyanine green, and diarylide orange. Inorganic pigments (used to a lesser extent) in printing inks include chrome green (Cr_2O_3), Prussian blue ($\text{Fe}_4[\text{Fe}(\text{CN})_6]_3$), cadmium yellow (CdS), and molybdate orange. White pigments, such as titanium dioxide, are used either by themselves or to adjust characteristics of color inks. Black ink is made using carbon black.

Printing ink is a dispersion distributed as a thin film on such media as paper, glass, board, film, plastics, foils, textiles, metal cans, to make images. It is an essential input in production lines of industries like textiles, newspapers/publishing industry, packaging, advertising, pharmaceuticals, etc.

III. MARKET STUDY AND PLANT CAPACITY

A. MARKET STUDY

1. Past Supply and Present Demand

There is no plant in the country that manufactures printing ink. As a result Ethiopia imports a variety of printing inks from different parts of the world. According to the Ethiopian Revenues

and Customs Authority, external trade statistics, Ethiopia imports black and other types of inks. Import of black and other types of printing inks for the past twelve years is shown in Table 3.1.

Table 3.1
IMPORT OF PRINTING INK

Year	Quantity (Tons)	Value (‘000 Birr)
2000	112	6,427
2001	124	4,220
2002	167	4,412
2003	154	5,277
2004	460	12,632
2005	372	13,377
2006	388	17,738
2007	418	17,403
2008	461	22,628
2009	496	29,681
2010	620	56,401
2011	309	37,146

Source: - Ethiopian Revenue and Customs Authority.

Import of printing in the past twelve years has shown a substantial growth. The yearly average imported quantity during the initial four years of the data set i.e. 2000--2003 was about 139 tons. After year 2003 the supply from import has almost tripled. Between the years 2004--2009, the lowest imported quantity was 372 tons and the highest 496 tons, with a mean figure of 420 tons. Imported volume in the year 2010 was exceptionally very high which stood at 620 tons. However, the volume declined to 309 tons by the year 2011. This is the effect of the exceptionally high volume imported during year 2010, which results a stock to carry over for the following year.

To estimate the present demand the recent three years (2009--2011) average is first considered to reflect the effective demand for the year 2011. This is done to smooth the highest and the lowest levels of import registered in last years of the data set. Then, a 10% growth rate (which is much below the observed trend of the past) is taken to arrive at year 2012 demand. Accordingly, the present demand for printing ink is estimated at 522 tons.

2. Demand Projection

Printing ink is one of the major inputs used by printing presses to produce books, magazines, news papers, cards, receipts etc. that require printing. Hence, the demand for printing ink is mainly influenced by the need for the above products. The need for the above products is in turn influenced by the performance of the national economy in general and paper and printing sub sector of the manufacturing sector in particular. Other factors which have an influence on the demand for the product are urbanization, increase in the number of literate population and performance of the education sector.

The positive performance of the economy in the past as well as the prospects in the future, the massive investments undergoing for expansion of education at all levels in the rural and urban areas and the fast growing urban population is expected to boost the demand for various types of printed items, which require printing ink. By considering the trend observed in the past and the combined effect of the above factors an annual average growth of 12% is taken in projecting the future demand. For details see Table 3.2.

Table 3.2**PROJECTED DEMAND FOR PRINTING INK (TONS)**

Year	Projected Demand
2013	584
2014	655
2015	733
2016	821
2017	920
2018	1,030
2019	1,154
2020	1,292
2021	1,447
2022	1,621
2023	1,816

3. Pricing and distribution

By taking the average CIF price of year 2011 and adding other costs the recommended factory-gate price is Birr 157,250 per ton of printing ink.

Since the end users of the product are limited in number direct sale, without involving intermediaries, is recommended. Special arrangements could also be made to cater for small quantity purchasers that might be found in several parts of the country.

B. PLANT CAPACITY AND PRODUCTION PROGRAM**1. Plant Capacity**

Based on the market study and other technical factors the envisaged plant will have annual production capacity of 1,000 tons of printing ink. The plant will operate in three shift of 8 hours a day, and for 300 days a year.

2. Production Program

Production will commence at 60%, and then will grow to 75%, 90% and 100% in the second year, third year and the fourth year and then after, respectively. This low level of capacity utilization at the early stage of the project is due to the need for skill development and market penetration. Detail production program is shown in Table 3.3 below.

Table 3.3
PRODUCTION PROGRAM

Year	1	2	3	4-10
Capacity utilization (%)	65	75	90	100
Production (tons)	650	750	900	1,000

IV. MATERIALS AND INPUTS

A. RAW AND AUXILIARY MATERIALS

The raw materials for ink production are pigments, binders, solvents and additives. Pigments- colour the ink and make it opaque, resins- bind the ink together into a film and bind it to the surface, solvents- make the ink flow so that it can be transferred to the printing surface and additives- alter the physical properties of the ink to suit different situations.

The type, quality, nature and quantity of raw material required are dictated by the type of printing ink to be produced. Different types of ink require different formulations and qualities. Generally, the main inputs are resins, waxes, dehydrated limestone, solvents, colored and mineral pigments, gums, water, preservatives, etc. Formulations of two types of inks commonly used in the Ethiopian printing industry are given as follows:

➤ **Letterpress ink for newspaper**

<u>Ingredient</u>	<u>% age (w/w)</u>
Carbon black (black pigment)	13.00
9 poise mineral oil (wetting agent)	68.00
0.5 poise mineral oil (wetting agent)	10.00
asphaltum solution	5.00
280-320°C petroleum distillate (solvent)	2.00

➤ **Lithographic ink for paper**

<u>Ingredient</u>	<u>% age (w/w)</u>
Organic pigment (color)	18.00
Quickset varnish	40.00
Gloss varnish	15.00
Fast setting varnish	15.00
Polyethylene wax paste (prevents damage to the film against rubbing)	5.00
Anti set-off paste	3.00
Cobalt/manganese driers (catalyst for drying oil oxidation)	1.00
280-320°C petroleum distillate (solvent)	3.00

The raw material cost is prepared by assuming that these two types of inks are produced in the proportion of 60% to 40%. The total cost of raw material is estimated at Birr 132.54 million. Annual consumption of raw and auxiliary materials at full production capacity is given in Table 4.1.

Table 4.1**RAW AND AUXILIARY MATERIALS REQUIREMENT AND COST**

Sr. No.	Description	Qty(tons)	Cost, ['000 Birr]		
			LC	FC	TC
1	Carbon black (black pigment)	78	485	1,455	1,940
2	9 poise mineral oil (wetting agent)	408	3,080	9,240	12,320
3	0.5 poise mineral oil (wetting agent)	60	400	1,200	1,600
4	asphaltum solution	30	850	2,550	3,400
5	280-320°C petroleum distillate (solvent)	24	250	750	1,000
6	Organic pigment (color)	72	2,800	8,400	11,200
7	Quickset varnish	160	11,200	33,600	44,800
8	Gloss varnish	60	5,100	15,300	20,400
9	Fast setting varnish	60	6,000	18,000	24,000
10	Polyethylene wax paste (prevents damage to the film against rubbing)	20	150	450	600
11	Anti set-off paste	12	2,790	8,370	11,160
12	Cobalt/manganese driers (catalyst for drying oil oxidation)	4	30	90	120
	Grand Total		33,135	99,405	132,540

B. UTILITIES

Electricity, water and fuel oil are the utilities required by the envisaged plant. The total cost of utilities is estimated at Birr 2,096,800. Details of utilities are shown in Table 4.2.

Table 4.2
UTILITIES REQUIREMENT AND COST

Sr. No.	Description	Quantity	Unit price (Birr)	Total Cost, (Birr)
1	Electricity (kWh)	2,160,000	0.58	1,252,800
2	Water (m ³)	10,000	10.00	100,000
3	Furnace oil (lt.)	50,000	14.88	744,000
	Grand Total			2,096,800

V. TECHNOLOGY AND ENGINEERING

A. TECHNOLOGY

1. Production Process

The process of printing ink production involves two stages: (i) varnish preparation and (ii) dispersal of pigments

Varnish preparation: Varnish is principally a mixture of solvent, resins and additives. It exists as a clear liquid that solidifies as a thin film, wets the pigment particles and binds the pigment to the printed surface. There are two main types of varnishes-oleoresinous and non-oleoresinous; the former incorporates a drying oil such as linseed oil and is manufactured at much higher temperatures and under vigorous conditions than the latter.

Oleoresinous varnish preparation: This process occurs in closed kettles where the oil and solvent are heated to allow for rapid solutioning or transesterification at the temperatures ranging from 120°C-260°C for a few minutes to several hours. The rate of temperature change, maximum temperatures attained and cooking times have to be closely monitored. The whole set-up is

equipped with a condenser to prevent the loss of solvent; nitrogen atmosphere is maintained to exclude the atmospheric oxygen, which may cause polymerization of drying oil.

Non-oleoresinous varnish preparation: These are simple resin solutions that do not require high temperatures during preparation. The process usually involves breaking up the resin particles and dissolving them in a solvent in either a cavitation or a rotor/stator mixer. Cavitation mixers contain a saw tooth disc on a driven shaft and are used to produce high viscosity resin solutions. They can operate at variable speeds. Rotor/stator mixers operate at a fixed speed; the varnishes obtained here are of lower viscosity since the agitation in the mixer is less.

Dispersal of pigments: After the preparation of varnish, the next step involves mixing or dispersal of pigments into it. Here, it is essential to observe that the pigment particles do not clump together. If the clumps are formed these have to be broken up with the help of three roll mill for even dispersal of pigments throughout the resin. The three roll mill consists of a series of rollers rotating in opposite directions. The pigment particles are to be fed into a hopper above the two rear-most rollers and are dispersed by the shear forces between the rollers.

A doctor blade is fitted to the front roller to remove the dispersed product. For reproducible dispersion, three parameters are to be strictly controlled- the roll pressure, their speed ratios and temperature. Water-cooling of each roll is also carried out to reduce the frictional heat build-up.

2. Environmental impact

Some of the pigments used in ink contain metallic substances which are harmful to human health and the environment such as cadmium, chromium, lead and mercury. Conventional printing inks are petroleum-based and used with alcohol-based solvents. As alcohol and petroleum evaporate Volatile Organic Compounds (VOCs) are emitted. VOCs represent environmental pollution and a health hazard to pressroom workers. In terms of atmospheric pollution, VOCs react with nitrogen oxides in the presence of sunlight to create ozone pollution or photochemical smog. Therefore, the plant has to be designed to contain a vapor emission from the production facility and also has to be equipped with waste water treatment plant, the cost of which is included in the cost of machinery and equipment.

B. ENGINEERING

1. Machinery and Equipment

The total cost of machinery and equipment with the envisaged capacity is estimated at Birr 3.2 million, out of which Birr 2.4 million is required in foreign currency. The list of machinery and equipment required by the envisaged plant is given in Table 5.1.

Table 5.1

MACHINERY AND EQUIPMENT REQUIREMENT

Sr. No.	Description	Qty. (No.)
1	Planetary mixer	1
2	Mixer blades	1
3	Triple roll mill	1
4	Weighing balances	1
5	Storage tankers	10
6	Grinding gauge	1
7	Proofing kit	1
8	Molders gauge	1
9	Pump	2
10	Vapor emission controlling equipment and waste water treatment plant	2 sets

2. Land, Building and Civil Works

The total land requirement, including provision for open space is 1,500 m², of which 1,000 m² will be covered by building. Estimating unit building construction cost of Birr 5,000 per m², keeping into consideration the buildings will be constructed from EGA sheet roof, prefab steel wall and cement tile floor. The total cost of building will be Birr 5,000,000.

According to the Federal Legislation on the Lease Holding of Urban Land (Proclamation No 721/2004) in principle, urban land permit by lease is on auction or negotiation basis, however, the time and condition of applying the proclamation shall be determined by the concerned regional or city government depending on the level of development.

The legislation has also set the maximum on lease period and the payment of lease prices. The lease period ranges from 99 years for education, cultural research health, sport, NGO , religious and residential area to 80 years for industry and 70 years for trade while the lease payment period ranges from 10 years to 60 years based on the towns grade and type of investment.

Moreover, advance payment of lease based on the type of investment ranges from 5% to 10%.The lease price is payable after the grace period annually. For those that pay the entire amount of the lease will receive 0.5% discount from the total lease value and those that pay in installments will be charged interest based on the prevailing interest rate of banks. Moreover, based on the type of investment, two to seven years grace period shall also be provided.

However, the Federal Legislation on the Lease Holding of Urban Land apart from setting the maximum has conferred on regional and city governments the power to issue regulations on the exact terms based on the development level of each region.

In Addis Ababa, the City's Land Administration and Development Authority is directly responsible in dealing with matters concerning land. However, regarding the manufacturing sector, industrial zone preparation is one of the strategic intervention measures adopted by the City Administration for the promotion of the sector and all manufacturing projects are assumed to be located in the developed industrial zones.

Regarding land allocation of industrial zones if the land requirement of the project is below 5,000 m², the land lease request is evaluated and decided upon by the Industrial Zone Development and Coordination Committee of the City's Investment Authority. However, if the land request is above 5,000 m² the request is evaluated by the City's Investment Authority and passed with recommendation to the Land Development and Administration Authority for decision, while the lease price is the same for both cases.

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

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

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

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

Table 5.2

NEW LAND LEASE FLOOR PRICE FOR PLOTS IN ADDIS ABABA

Zone	Level	Floor price/m²
Central Market District	1 st	1686
	2 nd	1535
	3 rd	1323
	4 th	1085
	5 th	894
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 399,000 of which 10% or Birr 39,900 will be paid in advance. The remaining Birr 359,100 will be paid in equal installments with in 28 years i.e. Birr 12,825 annually.

VI. HUMAN RESOURCE AND TRAINING REQUIREMENT

A. HUMAN RESOURCE REQUIREMENT

The plant requires 45 workers, and their annual expenditure, including fringe benefits, is estimated at Birr 1,401,750. For details see Table 6.1

Table 6.1

HUMAN RESOURCE REQUIREMENT AND ANNUAL LABOR COST

Sr. No.	Description	Req. No.	Salary, Birr	
			Monthly (Birr)	Annual (Birr)
1	Plant manager	1	10,000	120,000
2	Secretary	1	2,500	30,000
3	Production and technical manager	1	7,500	90,000
4	Finance and administration manager	1	7,500	90,000
5	Commercial manager	1	7,500	90,000
6	Accountant	3	10,500	126,000
7	Purchaser	2	7,000	84,000
8	Sales man	1	3,000	36,000
9	Production supervisor	1	2,800	33,600
10	Mechanic	2	4,000	48,000
11	Electrician	2	4,000	48,000
12	Chemists	2	6,000	72,000
13	Operators	4	6,000	72,000
14	laborers	6	3,600	43,200
15	personnel	1	3,000	36,000
16	Time keepers	2	1,800	21,600
17	Clerk	3	1050	12,600
18	Store keeper	2	1,800	21,600
19	Driver	3	1,800	21,600
20	Guard	3	1,200	14,400
21	Cleaner	3	900	10,800
	Sub- total	45	93,450	1,121,400
	Employee benefit (25% BS)	-	23,363	280,350
	Total		116,813	1,401,750

B. TRAINING REQUIREMENT

The production operators will be trained on the operation and maintenance of machinery for about four weeks during commissioning by the expert of machinery supplier. The total cost of training is estimated at Birr 50,000.

VII. FINANCIAL ANALYSIS

The financial analysis of the printing ink 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 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	10% of machinery cost

A. TOTAL INITIAL INVESTMENT COST

The total investment cost of the project including working capital is estimated at Birr 40.09 million (see Table 7.1). From the total investment cost, the highest share (Birr 26.68 million or 66.54%) is accounted by initial working capital followed by fixed investment cost (Birr 10.10 million or 25.37%) and pre operation cost (Birr 3.24 million or 8.09%). From the total investment cost Birr 2.40 million or 5.99% 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	21.28		21.28	0.05
1.2	Building and civil work	5,000.00		5,000.00	12.47
1.3	Machinery and equipment	800.00	2,400.00	3,200.00	7.98
1.4	Vehicles	1,500.00		1,500.00	3.74
1.5	Office furniture and equipment	450.00		450.00	1.12
	Sub total	7,771.28	2,400.00	10,171.28	25.37
2	Pre operating cost *				
2.1	Pre operating cost	620.00		620.00	1.55
2.2	Interest during construction	2,623.04		2,623.04	6.54
	Sub total	3,243.04		3,243.04	8.09
3	Working capital **	26,680.79		26,680.79	66.54
	Grand Total	37,695.11	2,400.00	40,095.11	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 44.52 million. However, only the initial working capital of Birr 26.68 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 140.51 million (see Table 7.2). The cost of raw material account for 94.32% of the production cost. The other major components of the production cost are financial cost, utility and depreciation which account for 1.64%, 1.49% and 0.93%, respectively. The remaining 1.62 % is the share of repair and maintenance, 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)**

Items	Cost (in 000 Birr)	%
Raw Material and Inputs	132,540	94.41
Utilities	2,097	1.49
Maintenance and repair	320	0.23
Labor direct	1,121	0.80
Labor overheads	280	0.20
Administration Costs	250	0.18
Land lease cost	0	0.00
Cost of marketing and distribution	300	0.21
Total Operating Costs	136,909	97.53
Depreciation	1,309	0.93
Cost of Finance	2,164	1.54
Total Production Cost	140,382	100.00

C. FINANCIAL EVALUATION**1. Profitability**

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 11.81 million to Birr 14.06 million during the life of the project. Moreover, at the end of the project life the accumulated net cash flow amounts to Birr 159.57 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.

$$\text{Break - Even Sales Value} = \frac{\text{Fixed Cost} + \text{Financial Cost}}{\text{Variable Margin ratio (\%)}} = \text{Birr } 66,045,000$$

$$\text{Break -Even Capacity utilization} = \frac{\text{Break -even Sales Value}}{\text{Sales revenue}} \times 100 = 21\%$$

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 2 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 28.88% 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 74.72 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 45 persons. The project will generate Birr 39.28 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 printing and publishing sector and also generates income for the Government in terms of tax revenue and payroll tax.

Appendix 7.A

FINANCIAL ANALYSES SUPPORTING TABLES

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

Item	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11
Raw Material and Inputs	79,524	92,778	106,032	132,540	132,540	132,540	132,540	132,540	132,540	132,540
Utilities	1,258	1,468	1,677	2,097	2,097	2,097	2,097	2,097	2,097	2,097
Maintenance and repair	192	224	256	320	320	320	320	320	320	320
Labour direct	673	785	897	1,121	1,121	1,121	1,121	1,121	1,121	1,121
Labour overheads	168	196	224	280	280	280	280	280	280	280
Administration Costs	150	175	200	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	300	300	300	300	300	300	300	300	300	300
Total Operating Costs	82,265	95,926	109,587	136,909	136,915	136,915	136,915	136,915	136,915	136,915
Depreciation	1,309	1,309	1,309	1,309	1,309	245	245	245	245	245
Cost of Finance	0	2,885	2,525	2,164	1,803	1,443	1,082	721	361	0
Total Production Cost	83,574	100,120	113,421	140,382	140,028	138,603	138,242	137,882	137,521	137,160

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	94,35 0	117,93 8	141,52 5	157,25 0	157,25 0	157,25 0	157,25 0	157,25 0	157,25 0	157,25 0
Less variable costs	81,96 5	95,626	109,28 7	136,60 9	136,60 9	136,60 9	136,60 9	136,60 9	136,60 9	136,60 9
VARIABLE MARGIN	12,38 5	22,312	32,238	20,641	20,641	20,641	20,641	20,641	20,641	20,641
in % of sales revenue	13.13	18.92	22.78	13.13	13.13	13.13	13.13	13.13	13.13	13.13
Less fixed costs	1,609	1,609	1,609	1,609	1,616	552	552	552	552	552
OPERATIONAL MARGIN	10,77 6	20,703	30,629	19,032	19,026	20,090	20,090	20,090	20,090	20,090
in % of sales revenue	11.42	17.55	21.64	12.10	12.10	12.78	12.78	12.78	12.78	12.78
Financial costs		2,885	2,525	2,164	1,803	1,443	1,082	721	361	0
GROSS PROFIT	10,77 6	17,818	28,104	16,868	17,222	18,647	19,008	19,368	19,729	20,090
in % of sales revenue	11.42	15.11	19.86	10.73	10.95	11.86	12.09	12.32	12.55	12.78
Income (corporate) tax	0	0	0	5,061	5,167	5,594	5,702	5,810	5,919	6,027
NET PROFIT	10,77 6	17,818	28,104	11,808	12,056	13,053	13,305	13,558	13,810	14,063
in % of sales revenue	11.42	15.11	19.86	7.51	7.67	8.30	8.46	8.62	8.78	8.94

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	10,791	123,726	117,950	141,537	157,250	157,250	157,250	157,250	157,250	157,250	157,250	50,096
Inflow funds	10,791	29,376	12	12	0	0	0	0	0	0	0	0
Inflow operation	0	94,350	117,938	141,525	157,250	157,250	157,250	157,250	157,250	157,250	157,250	0
Other income	0	0	0	0	0	0	0	0	0	0	0	50,096
TOTAL CASH OUTFLOW	10,791	111,641	106,873	120,173	156,649	147,493	147,559	147,306	147,054	146,801	142,942	0
Increase in fixed assets	10,791	0	0	0	0	0	0	0	0	0	0	0
Increase in current assets	0	26,753	4,455	4,455	8,909	1	0	0	0	0	0	0
Operating costs	0	81,965	95,626	109,287	136,609	136,615	136,615	136,615	136,615	136,615	136,615	0
Marketing and Distribution cost	0	300	300	300	300	300	300	300	300	300	300	0
Income tax	0	0	0	0	5,061	5,167	5,594	5,702	5,810	5,919	6,027	0
Financial costs	0	2,623	2,885	2,525	2,164	1,803	1,443	1,082	721	361	0	0
Loan repayment	0	0	3,607	3,607	3,607	3,607	3,607	3,607	3,607	3,607	0	0
SURPLUS (DEFICIT)	0	12,085	11,077	21,364	601	9,757	9,691	9,944	10,196	10,449	14,308	50,096
CUMULATIVE CASH BALANCE	0	12,085	23,162	44,526	45,127	54,885	64,576	74,519	84,715	95,164	109,472	159,568

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	94,350	117,938	141,525	157,250	157,250	157,250	157,250	157,250	157,250	157,250	50,096
Inflow operation	0	94,350	117,938	141,525	157,250	157,250	157,250	157,250	157,250	157,250	157,250	0
Other income	0	0	0	0	0	0	0	0	0	0	0	50,096
TOTAL CASH OUTFLOW	37,472	86,708	100,369	118,472	141,970	142,082	142,509	142,618	142,726	142,834	142,942	0
Increase in fixed assets	10,791	0	0	0	0	0	0	0	0	0	0	0
Increase in net working capital	26,681	4,443	4,443	8,885	1	0	0	0	0	0	0	0
Operating costs	0	81,965	95,626	109,287	136,609	136,615	136,615	136,615	136,615	136,615	136,615	0
Marketing and Distribution cost	0	300	300	300	300	300	300	300	300	300	300	0
Income (corporate) tax		0	0	0	5,061	5,167	5,594	5,702	5,810	5,919	6,027	0
NET CASH FLOW	-37,472	7,642	17,569	23,053	15,280	15,168	14,741	14,632	14,524	14,416	14,308	50,096
CUMULATIVE NET CASH FLOW	-37,472	29,830	-12,260	10,792	26,073	41,241	55,981	70,613	85,138	99,554	113,861	163,958
Net present value	-37,472	6,947	14,520	17,320	10,437	9,418	8,321	7,509	6,776	6,114	5,516	19,314
Cumulative net present value	-37,472	30,525	-16,004	1,316	11,752	21,170	29,491	37,000	43,775	49,889	55,405	74,719

NET PRESENT VALUE 74,719
INTERNAL RATE OF RETURN 28.88%
NORMAL PAYBACK 2 years