PROJECT PROFILE ON GLASS BOTTLE PRODUCTION

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ADDIS ABEBA CITY ADMINISTRATION INVESTMENT COMMISSION

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I. Executive summary

This project profile is prepared to assess the viability of running Glass bottle factory, in Addis Abeba city administration. Hence Market, Technical, Organizational and Financial study was made to investigate the viability of the envisaged project.

This project profile on Glass bottle manufacturing factory has been developed to support the decision –making process based on a cost benefit analysis of the actual project viability. This profile includes marketing study, production and financial analysis, which are utilized to assist the decision-makers when determining if the business concept is viable. Ethiopia has a private sector driven Glass bottle manufacturing industry. According to the latest data sourced from Ethiopian investment commission there are 75 registered companies to invest on glass bottle manufacturing and related products in Ethiopia, out of them only 26 companies are on operational stage whiles others on pre-implementation and implementation stage.

The location of the plant will be decided on the basis of access to raw materials, infrastructure namely power, water, transport and telecom to easy access to international market. The factory at full capacity operation will produce 20,000,000 pcs of 300gm amber bottle, per year based on 260 working days and their shifts of 24 hours per day.

The total investment capital including establishing the factory is Birr 252.77 million. Out of the total investment capital, the owners will cover Birr 75.83 million (30 %) while the remaining balances amounting to Birr 176.94 million (70 %) will be secured from bank in the form of term loan.

As indicated in the financial study, the cash flow projection of the project shows surplus from the first year on. The net cash flows of the project range from Birr 63.41 Million in the first year to Birr

91.44 million at the end of the 10th year of operation. At the end of the 10th year of operation period the cumulative cash balance reaches Birr 901million. The Benefit-cost ratio and Net present value (NPV) have been calculated at 17% discount factor (D.F) for 10 years of the project activity. Accordingly, the project has NPV of 542.40 million Birr at 17%D.F. and the benefit-cost ratio of 1.76 at 17% D.F.

Therefore, from the aforementioned overall market technical and financial analysis we can conclude that the Glass bottle manufacturing factory business is a viable and worthwhile.

1. Background information

1.1. Introduction

This document was undertaken to show Glass bottle production investment profile in Addis Ababa. In compiling the report, information from Addis Ababa investment commission, Addis Ababa trade and industry development, Ethiopian custom commission and published sources have been augmented.

Presently, in spite of high demand and its crucial importance, glass bottle are in short supply and also significant amounts are imported from abroad.

The provision of adequate glass bottle is fundamental importance to Ethiopia's present and future demand of many industries. In Ethiopia, the demand for glass bottle is expected to increase considerably in the next few decades as a result of increased industrialization, population growth, urbanization and increasing income levels. Thus, identifying potential of local distribution transformer production is crucial in a country like Ethiopia.

1.2. Product description

Glass bottles shall mean transparent or translucent containers made from silica or sand, soda ash and limestone, used for the packaging or bottling of various products. Glass bottles are vitreous silica compounds produced in a suction fed type blowing machine. Glass bottles are used for handling liquid, paste or powder products from beverage, cosmetic or pharmaceutical industries. Shape, color and size of glass bottles may vary according to client's demand, architecture and strength. Almost all glass bottles are flat bottom, straight with a 'neck' for corking or sealing.

1.3. Project location and justification

1.3.1. Location of Addis Ababa

Addis Ababa is the seat of the Ethiopian federal government. It is located on the central highlands of Ethiopia in the middle of Oromia Region. The absolute location is around the intersection point of 901'48''N latitude and 38°44′24″E longitudes. This is very near to the geographical center of the country. It is, therefore, equidistant to the peripheral areas or is equally accessible to almost all parts of Ethiopia. Addis Ababa is located on a well-watered plateau surrounded by hills and mountains. The city is in the highlands on the edge of the Ethiopian rift valley or the eastern slopes of the Entoto Mountain ranges bordering the Great Rift Valley. The total area of Addis Ababa is about 540 km^2 of which 18.2 km^2 are rural. Addis Ababa's built-up urban area spans 474 km^2. It is also the largest city in the world located in a landlocked country.

1.3.2. Demography of Addis Ababa

According to the CSA (2013) population projection, Ethiopia's total population reaches about 105 million people in 2022. Of the total population 22.9% (24 million people) live in urban areas. Ethiopia's urban population is expected to triple by 2037 (World Bank, 2015). Addis Ababa hosts an estimated 3,859,638 people. Currently, Addis Ababa is experiencing an annual growth rate of 3.8% and is estimated to reach 4,696,629 inhabitants by 2032 (CSA, 2015).

1.3.3. Economic activity of Addis Ababa

The transformation of Addis Ababa has especially been rapid since 1991. According to the data from the city's Bureau of Finance and Economic Development (2006), per capital income of Addis Ababa

has grown from USD 788.48 in 2010 to USD 1,359 in 2015. The city also achieved a decline in the poverty index from a high of 29.6 in 2012 to 22.0 in 2014. Moreover, the current poverty headcount index for Addis Ababa is estimated at 18.9 while the poverty severity account for 5 and 1.8 index points respectively. Even though, the poverty status of Addis Ababa has an improvement over previous years, there is still much work to be done to curb both the incidence and severity of poverty.

The major contributor to the economic growth of the city is the implementation of publicly financed mega urban projects like condominium housing, the Light Rail Transit, the international airport and industrial zone development (The state of Addis Ababa, 2017). The existence of international large and medium-size enterprises in and around Addis Ababa have also significant role in creating huge opportunity for employment and technology transfer. Furthermore, there are strong demand for goods and services following the existence of many embassies and inter-governmental organizations like the African Union, the United Nations Economic Commission for Africa.

The manufacturing sector's contribution to Addis Ababa's GDP is high. Despite the fact that 86% of the industries in the city are micro and small scale (cottage and handicrafts, and small-scale), the majority of the country's large and medium scale industries are found in the city. Noticeable increases are also registered currently in other aspects of industrial growth.

The service sector is both the largest contributor to the city's economy and the largest employer. It contributes to 76.4% of the city's GDP while industry's share makes up (almost all) the rest. This sector is dominated by three major sub-sectors: Transport and communication; Real estate, Renting and Business services; and Trade, Hotel and Restaurants. According to the state of Ethiopian Cities 2015 report, the service sector has also been responsible for more than 50% of the growth in the estimated annual growth of the city's GDP. Although 75% of employment in the city is also

generated in the service sector, a large proportion of the employed work in low skill and low paying jobs as shop salespersons, petty and 'gullit' traders, sales workers in small shops, domestic helpers or doorkeepers and restaurant service workers.

Analysis of the economic structure of Addis Ababa reveals that the services sectors (63%) dominates with industry (36%) in second place indicating that these sectors account for almost all of the Addis Ababa's GDP (The State of Addis Ababa, 2017).

Addis Ababa has a great share in the economy of the country due to its attractiveness to businesses, companies, individuals and foreign direct investment. Overall primacy index of the city is 24.8 based on urban employment and unemployment survey (CSA 2015). According to the State of Addis Ababa 2017 report, the simultaneous high rates of economic growth and urbanization in Addis Ababa indicates a likely further rising dominance of the city in Ethiopia's economy as well as growing agglomeration of economic activities in and around the city.

1.4. Why is it beneficial to invest in Addis Ababa?

Addis Ababa is the largest and most economically significant city in the country. Ethiopia's urban population share is only 17 percent (as of 2012, World Bank 2015). The city is the only urban area in Ethiopia capable of delivering scale economies in terms of concentrated demand, specialization, diversity and depth of skills, innovation, and technology transfers. Thus, investors will be benefited in getting capable human power from the market.

The capital is the country's main industrial hub. The city dominates industrial capacity in almost all the braches of light manufacturing that Ethiopia prioritizes. As a result Addis Ababa completely dominates production in various subsectors. This can be taken as the political and social stability of the city.

Overall, the city has a beautiful environment, favorable location, and strong industrial base. Its advantage as an economic powerhouse of the country and human resource center are the most attractive features for local and overseas investors.

Moreover, investors will be getting a comprehensive set of incentives for priority sectors. These include:

- Customs duty free privilege on capital goods and construction materials, and on spare parts whose value is not greater than 15% of the imported capital goods' total value.
- Investors have the right to redeem a refund of customs duty paid on inputs (raw materials and components) when buying capital goods or construction materials from local manufacturing industries.
- Income tax exemption of up to 6 years for manufacturing and agro-processing, and up to 9 years for agricultural investment.
- Additional 2-4 years income tax exemption for exporting investors located within industrial parks and 10-15 years exemption for industrial park developers.
- Loss Cary forward for half of the tax holiday period. Several export incentives, including Duty Draw-Back, Voucher, Bonded Factory, and Manufacturing Warehouse, and Export Credit Guarantee schemes.

1.4.1. The city benefit from the investment

The city will be benefited from investment. These are discussed below.

- Employment opportunity

Investment is expected to provide direct and indirect employment. These range from unskilled causal workers, semi-skilled and skilled employees.

- Improving growth of the economy

  Through the use of locally available materials and exporting products, the investment contributes towards growth of the economy by contributing to the growth of domestic product. These eventually attract taxes including VAT which will be payable to the government hence increasing government revenue while the cost of local materials will be payable directly to the producers. In addition, domestic products save foreign exchange and exports also bring money to the country.

2. Marketing study

2.1. Market analysis summary

The current drive and emphasis by the government on the diversification of the industrial base away from the other sector presents an opportunity for production industry to a valuable contribution towards achieving goal. Having undertaken a thorough and comprehensive research of the market we realized that there was a vast opportunity for domestic products. Aware of the fact operating in such a market is largely dependent on good networking, the promoter intends to establish networks and strategic relationships with various wholesalers and retailers to ensure a steady stream of orders. In so doing the owner intend to ensure that the products they produce are of extremely high quality and fully serve the customers purpose.

2.2. The Supply of Glass bottle

2.2.1. Local Glass Bottle Supply

In Ethiopia there are large scales, medium and household level Glass bottle manufacturing factories. The average supplied quantity of those factories are 134,560,000pcs of glass per year

Table 1 Glass bottle produced per year in Ethiopia in pcs

	2005	2006	2007	2008	2009	Average
Local bottle glass supply	18,785,000	0.00	33,886,000	482,697,000	2,872,000	134,560,000

Sources: - CSA

2.2.2. Import

The supply of Glass bottle has been met both through import and domestic production. Although there is no apparent trend in the growth of imported glass bottle.

Table 2 Volume of imported Glass bottle from 2012 to 2021 in kg

Year	Gross weight (in Kg)	Net weight (in Kg)	CIF value in (ETB)	CIF value in USD	Total TAX in ETB	Total Tax USD	Growth
2012	7,347,980	6,985,195	171,055,469	9,574,572	86,438,705	4,838,276	
2013	8,810,062	8,414,630	211,702,454	11,260,709	104,989,118	5,584,498	
2014	11,884,704	11,377,082	261,453,225	12,979,469	136,270,302	6,764,943	
2015	11,966,000	11,559,815	289,639,266	13,937,026	150,245,294	7,229,588	
2016	6,094,792	5,889,803	142,679,132	6,605,974	73,041,158	3,381,770	
2017	17,719,484	17,338,349	412,805,225	17,046,163	215,362,108	8,893,050	
2018	6,133,007	6,044,251	173,130,790	6,256,986	83,560,162	3,019,883	
2019	4,020	4,014	145,517	4,982	74,133	2,538	
2020	15,561,421	15,275,138	583,544,657	16,696,557	313,193,229	8,961,180	
2021	14,029,778	13,696,106	783,169,167	17,670,784	499,617,065	11,272,948	
Average	9,955,125	9,658,438	302,932,490	11,203,322	166,279,127	5,994,867	

Source: ERCA and compiled by consultant

As it has been shown in table 2 import of Glass bottle which was 6,985,195 kg at the beginning of the period (2012) has increased to 13,696,106kg by the end of, 2021. A closer observation at the data set reveals that imported Glass bottle over the study period has shown varying patterns. Based on the data obtained from Ethiopia customs Authority, the annual average volume of imported Glass bottle is 9,658,438 kg from 2012 through 2021.

2.2.2.1. Forecasted future import of Glass bottle

Table 3 Future forecast of import of Glass bottle by trend adjusted exponential smoothing method

Year	Imported Glass bottle from 2012 to 2021 in kg.	Trend Adjusted exponential smoothing method
2012	6,985,195	
2013	8,414,630	
2014	11,377,082	
2015	11,559,815	
2016	5,889,803	
2017	17,338,349	
2018	6,044,251	
2019	4,014	
2020	15,275,138	
2021	13,696,106	
2022		13,696,106
2023		14,367,197
2024		15,038,288
2025		15,709,379
2026		16,380,470
2027		17,051,562
2028		17,722,653
2029		18,393,744
2030		19,064,835
2031		19,735,926
2032		20,407,017

Compiled: - by consultant

2.2.2.2. Effective demand in the past ten years

Table 4 effective demand in the past ten years

Year	Domestic Glass bottle production from 2012 to 2021 in kg.	Imported glass from 2012 to 2021 in kg	Effective demand for the last ten years	Growth rate
2012	6,199,050	6,985,195	13,184,245	
2013	6,199,050	8,414,630	14,613,680	11%
2014	-	11,377,082	11,377,082	-22%
2015	11,182,380	11,559,815	22,742,195	100%
2016	159,290,010	5,889,803	165,179,813	626%
2017	947,760	17,338,349	18,286,109	-89%
2018	947,760	6,044,251	6,992,011	-62%
2019	947,760	4,014	951,774	-86%
2020	947,760	15,275,138	16,222,898	1604%
2021	947,760	13,696,106	14,643,866	-10%

2.2.2.3. Glass bottle Demand Projection

The demand for Glass bottle can be influenced by a number of factors. The demand for Glass bottle is a function of pharmaceutical industries, beverage industries, cosmetic industries price of substitutes, and other exogenous factors. The size of population and its growth rate, disposable and income prices are few among many variables.

Considering the growth of population and the increasing number of food and pharmaceutical manufacturing enterprises demand is projected by applying a 20% annual growth rate on the bases of ten years' average which is 28,419,367 kg.

The future demand for glass bottle depends mainly on the growth of the manufacturing sector particularly the food and pharmaceuticals. During the past ten years, the annual average growth of

demand for imported glass bottle has been more than 100% per annum. As per the data of the Ethiopian Investment commission there are a number of manufacturing projects which are licensed for implementation. When the projects become operational the demand for the product will

undoubtedly increase significantly. By considering the past trend, which was more than 100% annual growth rate for imported glass bottle, and future prospects of the industrial sector demand for glass bottle is assumed conservatively to grow by 20% per annum, on the base figure is last ten years' average which is 28,419,367 kg.

Table 5 Projected Demand for Glass bottle in Ethiopia

Year	Projected demand
2022	34,103,240
2023	40,923,888
2024	49,108,666
2025	58,930,399
2026	70,716,479
2027	84,859,775
2028	101,831,730
2029	122,198,076
2030	146,637,691
2031	175,965,230
2032	211,965,276

As it is indicated above the projected demand for Glass bottle in 2022 is 34,103,240 kg. This volume will increase to 211,965,276 kg in the year 2032.

2.2.2.4. Demand-Supply Gap Analysis

When we see the historical supply volume of Glass bottle in Ethiopia there is no apparent trend in the growth. Because both the import and production data are found to be erratic. Hence, it is found difficult to objectively forecast the future supply volume. Single exponential smoothing method was used, for forecasting purposes. A 2.5% growth rate, glass bottle production, is also assumed for local production increase, for new as well as expansion projects for domestic manufacturers though most of the existing Glass bottle factories.

Table 6 Demand supply gap Analysis

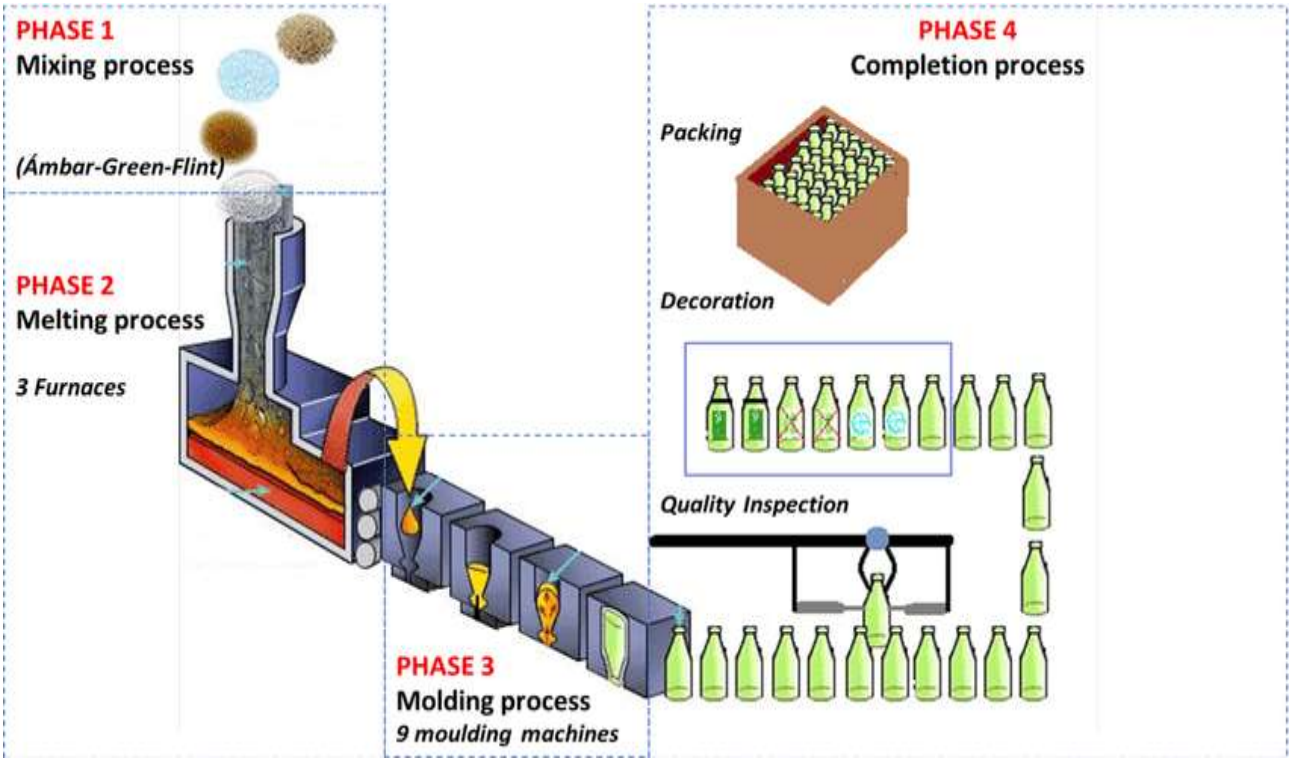
Year	Domestic production in (in kg)	Import in (kg)	Demand (in kg)	Excess demand(kg)
2022	971,454	13,696,106	34,103,240	33,131,786
2023	995,740	14,367,197	40,923,888	39,928,148
2024	1,020,634	15,038,288	49,108,666	48,088,032
2025	1,046,150	15,709,379	58,930,399	57,884,249
2026	1,072,303	16,380,470	70,716,479	69,644,176
2027	1,099,111	17,051,562	84,859,775	83,760,664
2028	1,126,589	17,722,653	101,831,730	100,705,141
2029	1,154,754	18,393,744	122,198,076	121,043,322
2030	1,183,622	19,064,835	146,637,691	145,454,069
2031	1,213,213	19,735,926	175,965,230	174,752,017
2032	1,243,543	20,407,017	211,965,276	210,721,733

As shown in the above table, the project will have unsatisfied demand for the coming 10 years' period. The projected demand will continue to be positive until 2032. It can be clearly noted that there is a huge gap between supply and demand figures, which can really be taken as the apparent demand-supply gap for Glass bottle in Ethiopia. This is really the actual unsatisfied demand as imports have to be substituted that also helps in saving the foreign currency outflow from the country. The unsatisfied demand for Glass bottle for the year 2032 estimated at 210 million kg.

3. Technology and engineering

3.1. Technology

3.1.1. Glass bottle production process



Glass bottles are manufactured by melting sand and blowing the molten viscous material into required shape using a mould and then cooled

Steps in Glass Bottle Manufacturing Process

Raw Materials Preparation:

- The primary raw materials are used in manufacturing glass bottles are Sand, Soda ash, Limestone and Cullet.
- Sand is the body former which gives the strength to the glass once it is made. Usually, the percentage of silica or sand varies based on the type or usage of the glass bottle. The percentage of the Silica is 70% plus or minus 10%. The melting point of the glass is inversely propositional to the silica content present in the composition. Initially, silica is crushed and grounded to fine particle size and then stored in storage hopper. The size of the quartz is reduced up to 50#.
- Soda ash is used as a fluxing agent. Which helps to lower the melting point of the silica present in the glass.
- Cullet means the recycled glass. One of the best property of the glass is it can be recycled. 10% to 20% cullet is added in the composition based on the property required for the glass. Culets may be a defect piece from the production process or maybe a recycle from the real world market. Both ways the Glass is recycled to avoid any damage to the environment. Cullet's are initially stored and then broken into smaller size materials using the crushers. From the hopper, size reduced recycled glass material is carried to another storage hopper using belt conveyor. Manually foreign elements will be removed, and magnets are used to remove the iron in this conveyers.
- Colour glass will be produced by adding an oxide to the compositions.

Batching Process:

- The glass bottle production process is a continuous process so batching also done continuously to feed the furnace. The continuous feed of raw material to the furnace is done by belt conveyer until the furnace beginning.
- Raw materials are proportionally fed into the hopers and then mixed and unloaded and transferred to the furnace.
- In the conveyor again magnet is used to remove any iron materials present in the conveyor.
- Iron is the foreign contamination that should not be allowed in the raw materials. Because metal will not burn off and creates specks in the clear bottle. Any other organic matter will be burned at the initial melting process. Also, the air bubbles can be cleared at the later stage of the melting.
- The mixer of raw materials will be added to the furnace like a batch. The reason is to make sure the composition of the mixer is the same for all the products.

Melting Process:

- Every batch of the raw materials fed into the furnace will be heated and melted, and continuously send to the next process.
- The peak temperature of the glass melting furnace can vary based on the composition. It usually ranges from 1400 degree Celsius to 1600 degree Celsius.

- There are three things process happens inside the furnace. They are as follows: 1) Melting 2) Clarification or Soaking 3) Cooling

Melting:

- The first stage is melting; during this stage, the raw materials are heated and melted to get viscous mass. The process starts with water evaporation and proceeds to organic matters burn off, and silica transformation and then the composition begins to melt.
- The glass bottle melting furnace is made of silica-based refractories to avoid any contamination of the raw materials. To maintain the excellent firing curve and to get the better fuel efficiency, the Air and fuel ratios will be adequately monitored.
- The atomization of fuel in the burner helps to get the higher fuel efficiency. These controllers are the cost-effectiveness of the process. Because the most significant contributor to the glass manufacturing cost is the fuel used in the process. Around 40% of the total cost of the glass is contributed by the fuel used.
- The modern furnace does the job efficiently to get the best fuel efficiency. The controllers are done automatically, and any failure in the machinery the alarm will go off.

Soaking or clarification:

- A part of the composition may not be melted because of the rapid heating, so to make sure everything is melted the composition is maintained at peak temperature for 3 to 8 hours based on the composition.

- Moreover, the air bubbles formed in this stage are allowed to pass through the melted glass. Trapped air will create a defect in the product. So during the soaking time, it is essential to remove the air bubbles present inside the molten glass.

Cooling Stage:

The Molten glass is cooled to lower temperature to make the viscous condition. Because if the glass is fluid like condition is difficult to blow into the required shape. Once it is cooled, it will become a viscous state then it is sent for the feeders.

Feeders:

- The next stage of the glass bottle manufacturing is to feed the glass blowers.
- Feeders do this process. Feeders have openings at the bottom of the furnace end.
- Low shear panels control these openings. This shear panels continuously cut the molten glass to get the required quantity of viscus mass for blowing.
- The amount of mass passed through the opening can be controlled by the speed of the sheer panels. The rate of the shear panel is controlled when required for different sizes of the glass bottles. If need a big size glass the sheer panel speed will be less and vice-versa.
- The cut glass mass is called as garbs; The garbs forms elongated shape during the cut from the furnace.
- The garbs are ready for the next process and now it one step away from to get the shape. The next step is blowing.

Blowing:

- The forming machine will transfer the garbs into containers.
- The air is blown through the forming machine when the garbs are placed inside moulds. Now the hot air is blown into the garbs to form the shape of the mould. Hot air is used to avoid sudden Colling or sudden thermal shock to the glass.
- The formed shape is released from the mould. And Then based on the shape required a second part may be attached when at this temperature. After this temperature, we can't join anything to the glass body. If you need to anything to the body, then you need to melt the bottle again.
- In this stage, the bottle cap sealer line is marked or joined to the body.
- Once the shape formation is complete, then it is sent for the next stage called Hot end coating.

Hot End Coating:

- A Thin layer of tin is applied in the process. The coating is used to give the better strength for the glass bottle.
- The application of the tin coating to the body of the glass bottle is made at around 350-degree Celsius.

Annealing:

- When the glass container is formed, the outside surface cools more rapidly than the interior side, causing stress in the glass.

- To avoid this problem, the annealing process is carried out. During the annealing process, the inside and outside of the bottle are cooled evenly to avoid any stress creation.

Cold end Coating:

- A thin layer of polymer is applied to the glass container. The temperature of the polymer coating lies around 100-degree Celsius.
- This layer is given to the glass container to provide a scratch resistant to the outer surface of the bottle.

Inspection

- All glass containers are checked for any foreign contamination in the glass and air bubbles in the glass.
- The inspection is done at multiple levels. Both automatic and manual checkings are done to ensure the product quality is perfect for the customers.
- Some of the things checked during are the size of the product, the shape of the product, cracks in the body, pinholes and contamination and air trapped inside the bottles. These are the major defects in the glass bottles during the production process.
- All this inspection is done in the continuous conveyor where the bottles are passes, and multiple inspectors are checking the defects.
- Once the classification is done the good products are sent to the next stage for packing. Defected bottles are sent to the recycling and used as cullet in the batch composition.
- Also, all the defects are recorded to give feedback to the production to reduce the defects.

Packing:

All the good bottles are packed based on the customer requirement. Usually, glass bottles are wrapped in a cardboard box which has multiple segments separated by corrugated sheets. Packing is done by automation to avoid any damage during preparation.

3.1.2. Environmental and social impact assessment of the project

Typically, any developmental projects also trigger a set of environmental and social impacts. These environmental and social due to development projects occur in different forms. An Environmental and Social Impact Assessment (ESIA) has to be carried out to study the potential environmental and social impacts due to the production container glass. Potential environmental and social impacts due to the production of container glass products on attributes like air quality, noise, water quality, soil, flora, socio-economic, etc. have to be assessed as part of the ESIA study. Appropriate mitigation measures to help minimize/avoid impacts from the development have to be recommended in the study. The measures include avoidance measures, mitigation measures and environmental enhancement measures. For the purpose of including environmental costs, the costs of wastewater treatment plant and solid waste incineration systems are included in the cost of machinery and equipment. Social responsibility cost estimated to be 1% of fixed investment costs.

3.1.3. Production Capacity and Production Program

3.1.3.1. Plant capacity

The annual production capacity of the plant in full capacity is 20,000,000 pcs. The production capacity is based on projected demand and realistic market share that could be captured. The production commences three shift and 260 working days a year. The production program does not include Sundays and national and public holidays. It was also considered that the plant would conduct annual maintenance on May when the supply of raw materials is low.

3.1.3.2. Production program

The plant initially produces 70 % of its annual rated capacity bound to initial operating problems such as machine set up and marketing. The production capacity will increase by 10 % and attain its full capacity by the fourth year of its commencement.

Table 7 Production program

Period		Start-up			Full Capacity	
Capacity utilization		70%	80%	90%	100%	100%
Project year		1	2	3	4	5
Amber glass bottle	Pcs	14,000,000	16,000,000	18,000,000	20,000,000	20,000,000

3.2. Engineering

3.2.1. Land, buildings and civil works

The required area (m^2) and construction cost for the production facilities essential for the successful operation of the processing plant is shown in Table 8. A total area ready for the processing plant is 10,000m^2 out of which 5,366m^2 is to be covered by building while uncovered area of 4,634m^2 is left open for parking, storage of waste materials and future expansions. In order to estimate the land lease cost of the project profiles it is assumed that all the project will be located in different land level from level 1/1 to level 4/3, their current market lease price is from 39,073.31 birr per M^2 to 2,800.71 birr per M^2respectively. Therefore, for the profile a land lease rate of birr 3,885 per M^2 have been taken, which is between the ranges.

The cost of construction of building should be appropriate to the size and expected profitability of business, costs of building generally differs by the type of construction materials used, the type of foundation, wall height and location. The current building cost for simple storage and processing room is from 1,800.00 Birr per m^2 to 25,000 Birr per m^2. The total construction cost of buildings and civil works, at a rate of Birr 20,000 per m^2 is estimated at Birr 113.17 million. Therefore, the total cost of land lease and construction of buildings and civil works is estimated at Birr 163.775 million.

The proposed plant layout comprises the following buildings and structures.

Table 8 Building costs

S/No	Descriptions	Total area M^2	Estimated cost per square meter (in Birr)	Total estimated cost (in Birr)
1	Raw materials store	1,500	20,000.00	30,000,000.00
2	Raw materials preparation room	1,000	20,000.00	20,000,000.00
3	Glass bottle production line	1,000	20,000.00	20,000,000.00
4	Main product store	1,000	20,000.00	20,000,000.00
5	packing materials store	500	20,000.00	10,000,000.00
6	Office and toilet	200	20,000.00	4,000,000.00
7	Canteen	160	20,000.00	3,200,000.00
8	Guard house	6	20,000.00	120,000.00
9	parking	600	2,000	3,000,000.00
10	Green area and for future expansion	2,534	1,000	250,000.00
11	Fence			2,600,000.00
	TOTAL	10,000		113,170,000.00

Table 9 Land lease period in Addis Abeba

Sector of development activity	Period of lease	Down payment
Education, health, culture and sports	90	10%
Industry (manufacturing)	70	10%
commerce	60	10%
For urban agriculture	15	10%
For others	60	10%

Sources: - city government of Addis Abeba land development and management bureau

Table 10 Land lease floor price in Addis Abeba

S/No	Land level	Current land lease floor price per M^2	Current lease price per M^2 (Market price)
1	1/1	2,213.25	39,073.31
2	1/2	2,165.47	36,825.73
3	1/3	1,900.19	34,578.15
4	¼	1,552.93	31,119.21
5	1/5	1,531.91	29,096.45
6	2/1	1327.39	27,073.71
7	2/2	1,221.18	25,050.96
8	2/3	1,191.17	23,028.21
9	2/4	1,074.39	21,005.46
10	2/5	1,027.84	18,982.71
11	3/1	994.71	16,959.96
12	3/2	960.21	14,937.21
13	3/3	927.84	12,914.46
14	¾	904.77	10,891.71
15	3/5	873.74	8,868.96
16	4/1	814.06	6,846.21
17	4/2	786.45	4,823.46
18	4/3	748.80	2,800.71

Sources: - city government of Addis Abeba land development and management bureau

3.2.2. Machinery and equipment

The main plant and machinery consists raw material preparation line, melting furnace, forming machine, annealing and decorating machine. Major part of the machinery will be imported.

Table 11 Lists of Equipment Requirements for glass bottle manufacturing

Description	Unit of measure	Quantity	Total Costs
Raw material preparation line	Set	1	10,000,000.00
Melting furnace	Pcs	2	5,000,000.00
Forming machine	Pcs	3	7,500,000.00
Annealing machine	Pcs	2	5,000,000.00
Decorating and packing machine	Set	2	12,000,000.00
Boiler	Pcs	2	8,000,000.00
Generator	Pcs	1	5,000,000.00
Others	Lump sum	Lump sum	15,000,000.00
Total			67,500,000.00

3.2.3. Lists of machinery suppliers

ALIBABA
Hangzhou (Yuhang District) 969 West Wen Yi Road Yu Hang District, Hangzhou 311121 Zhejiang Province, China Tel: (+86) 571-8502-2088 Fax (Mainland China): (+86) 571-8656-1717 Fax (Hong Kong, Macao and Taiwan regions of China and Overseas): (+86) 571-8376-8429

J.C.L. ENGINEERING PTE LTD

60 Paya Lebar Road #10-55 Paya Lebar Square,
409051 Singapore

Tel: +65 6225 4867
Fax: +65 6223 8298
E-mail: jclsin@jochenlee.com

4. Glass bottle organizational structure

The selection of structure of the envisaged project is made based on the existing structure of manufacturing plants operating in the country, the capacity, complexity and technology mix of the plant. Organizational structure principles such as specialization, coordination, and departmentalization are also considered for design of structure that best suits the envisaged project

4.1. Manpower Requirement and Estimated Annual manpower costs

Table 12 Annual manpower costs

s/no	Description	Number of persons	Salary in birr	
			monthly	annually
1	General manager	1	45,000.00	540,000.00
2	executive secretary	1	15,000.00	180,000.00
3	Manager- admin. and finance	1	25,000.00	300,000.00
4	assistance manager- finance	1	20,000.00	240,000.00
5	accountant	1	15,000.00	180,000.00
6	cashier	1	10,000.00	120,000.00
7	personnel and general service	1	10,000.00	120,000.00
8	guards	5	3,000.00	180,000.00
9	driver ii	4	10,000.00	160,000.00
10	manager-production and technical	1	20,000.00	240,000.00
11	production clerk	1	4,000.00	48,000.00
12	chief quality controller	3	12,000.00	432,000.00
13	Production head	1	10,000.00	120,000.00
14	machine operator	3	5,000.00	180,000.00
15	assistant machine operator	3	3,000.00	108,000.00
16	senior mechanics	3	12,000.00	432,000.00
17	senior electrician	3	12,000.00	432,000.00
18	store keeper	1	10,000.00	120,000.00
19	manager- commercial	1	20,000.00	240,000.00
20	purchaser	1	10,000.00	120,000.00
21	sales- manager	1	15,000.00	180,000.00
	total	38		4,672,000.00

5. Financial Analysis

5.1. General

The financial analysis evaluation, under consideration has been carried out for Glass Bottle Manufacturing cost estimates of the envisaged factory are mainly consisted of capital investment as well as operating and maintenance costs. The capital investment costs include fixed investment costs (initial fixed investment and replacement costs) and working capital, while operating and maintenance costs comprise current expenses related to material inputs, labour, utility, repair and maintenance costs, spare parts, Overheads, Sales and distribution, interest and depreciation expenses.

The financial analysis and evaluation has been conducted taking assumptions:

1. It is assumed that about 70% of the total capital investment costs including the working capital requirement could be covered through development bank loans of short and long-term credits. The remaining balance 30% will be covered by equity capital contribution of the project owner.
2. Even though the project might secure loans under different term and conditions as well as from different financial sources, for the purpose of calculation of debt service scheduling, the current development bank of Ethiopia credit terms and conditions have been used. Consequently. It is assumed that the project will secure loan facility on the basis of 11.5 % annual interest rate, and 10 years' equal installments.
3. Even though the estimated project production life is more 10 years, the financial analysis has been undertaken for a period interval covering the first 10 years only, during which time

most of the capital assets are assumed to be deprecated, debts recovered and pay-back period accomplished.

4. It is assumed that the project will be start up production activity at 70 % capacity. During years 2 & year 3 the projects is anticipated to gradually increase capacity utilization to reach 100% in year 4. Therefore, starting from year 4 the project will be operational at full capacity.
5. For the project under reference promotional, sales and distribution expenses have been estimated at 3% of the sales revenue.
6. Maintenance and spare parts costs are 1.5% of the fixed investment costs.

5.2. Initial Fixed investment costs

Table 13 Initial Fixed investment costs

S/No	Fixed investment type	Unit of measurement	Quantity	Unit price	Total Amount	Remarks
1	Land	Square meter	10,000	3,885 birr/M^2	38,850,000.00	The period of land lease will be 70 years and 10% of the total lease amount will be paid in the first year
2	Buildings and civil works	Square meter	5,366	lump sum	113,170,000.00	
	Sub total				**152,020,000.00**	
3	Machineries	set	2	Lump sum	67,500,000.00	
4	Transformer	set	1	Lump sum	4,000,000.00	
5	Weighbridge	Set	1	Lump sum	4,000,000.00	
6	Truck and vehicles	Pcs	2	Lump sum	6,000,000.00	
7	Furniture and fixture	Pcs			500,000.00	
	SUB TOTAL				82,000,000.00	
	Fixed capital investment costs				234,020,000.00	
8	pre-operational expenses				2,000,000.00	
	Working capital					
	TOTAL INVESTMENT COSTS					

5.3. Working capital

Working capital is the financial means required for smooth operation and maintenance of a project mathematically, it is a difference between current assets and current liabilities. In the particular case of the project under consideration, the current assets comprise receivables, inventories (local and imported material inputs, spare parts, work in progress, and products ready for delivery) and cash in hand, while current liabilities comprise accounts payable to creditors.

5.4. Project Financing

Fixed capital investment costs and working capital requirements are assumed to be financed by equity capital of the owner and through loans of short and long-term credits.

As stated earlier even though the company obtains loans under different terms and condition as well as from different sources, for the purpose of calculation of debt service scheduling the current development bank of Ethiopia credit terms and conditions have been used. Accordingly, it is assumed that the company will be able to obtain loan 70% of the total investment costs for construction of different buildings, for purchase of machineries, for purchase of truck and vehicles (and for purchase of office furniture and pre operation expense will be covered through bank loans that will have to be repaid back within 10 years, during which time interest will be paid on the loan. The remaining balance (30%) that of the total investment costs will be expected to be covered by equity contribution of the project promoter.

5.5. Production costs

As it is depicted in Annex Table 19 major categories of the total production costs are assembled into the following cost elements.

5.5.1. Material inputs

At full capacity operation the material inputs costs are estimated at Birr 88.88 million per annum.

Table 14 Raw materials input plan in Birr to produce 20,000,000 pcs of bottle in birr '000'

	Period		 300gm/330ml			Start-up			Full Capacity
	Capacity utilization					70%	80%	90%	100%
	Project year					1	2	3	4
	Materials input for glass bottle	%	U/M	Quantity at full Capacity	Unit price				
1	Amber sand(SiO_2	18.14	kg	1,088,000	11.02	8,393	9,592	10,791	11,990
2	Flint sand	17.40	Kg	1,050,000	11.05	8,122	9,282	10,442	11,603
3	Soda ash	9.97	Kg	598,000	26.75	11,198	12,797	14,397	15,997
4	Limestone	9.09	kg	546,000	18.32	7,002	8,002	9,002	10,003
5	Aluminum oxide	0.22	Kg	14,000	142.85	1,400	1,600	1,800	2,000
6	Salt cake /sodium sulphate	0.30	Kg	18,000	111.11	1,400	1,600	1,800	2,000
7	Anthracite /coke carbon	0.12	kg	8,000	250	1,400	1,600	1,800	2,000
8	Red iron oxide	0.10	Kg	6,000	666.67	2,800	3,200	3,600	4,000
9	Culet /crushed bottles	44.60	Kg	2,746,000	10.66	20,491	23,418	26,345	29,272
	Total					62,205	71,091	79,977	88,864

5.5.2. Utilities

In estimating costs of utility expenses for operation and maintenance of the project, Costs of fuel, oil and lubricant, electricity and water consumptions have been taken in to consideration, the rates of which have been estimated on the basis of the proposed capacity utilization program of the project and at the current official charging rates. At full capacity operation the project will have the following utility expense per annum which amounts to Birr 4.66million.

Table 15 Utilities of the factory'000"Birr

Utility"000"Birr		Start-up			Full Capacity
Capacity utilization		70 %	80 %	90 %	100 %
Project year		1	2	3	4
Item description	Unit of measurement				
Fuel					
Gasoline for service vehicle	100km*260days*37Birr/LIT*8km/Li	84.18	96.20	108.1	120.25
Gasoline for transport truck	(200km*300days*37Birr/LIT*5km/Li)*3	932	1,066	1,199	1,332
Sub-Total		1016	1162	1307	1452
Change of oil and lubricant	10% of the fuel consumption	102	116	131	145
Sub-Total		1,118	1,278	1,438	1,597
Electricity	260days*24 hrs*600kwh* 0.69Birr/kwh	1,808	2,066	2,325	2,583
Sub- Total		1,808	2,066	2,325	2,583
Water	365days*100m^3/day*10 Birr/m^3	255.50	292.00	328.50	365.00
Sub -Total		255.50	292.00	328.50	365.00
Telecommunication					
Telephone	5 lines* 500Birr/month/line+18Birr/line/month	31.08	31.08	31.08	31.08
Mobile	5 lines*500 Birr/month/line	30.00	30.00	30.00	30.00
Fax	2line*1,000Birr/month + 17 Birr/line/month	24.40	24.40	24.40	24.40
Internet	2,500 Birr/month	30.00	30.00	30.00	30.00
Sub-Total		**115.48**	**115.48**	**115.48**	**115.48**
TOTAL		**3,297.00**	**3,752.00**	**4,207.00**	**4,661.00**

5.5.3. Repair and maintenance

In the expenses under this title have been considered cost estimates required for annual repair and maintenance works including spare parts expenses. These costs include the annual repair expenses of structures and civil works as well as repair and maintenance expenses of machinery and equipment including accessory and general service facilities. The repair and maintenance and spare parts costs have been assumed to be (1.5% of fixed costs and spare part costs).

5.5.4. Salaries and wages

The costs of salaries have been calculated in accordance with the manning list proposed under the "organization and Management" section of this study. In the estimation of salaries and wages, the official minimum wage has been taken in to account. At full capacity operation the costs of salaries and wages will amount to Birr 5.646 Million.

5.5.5. Over heads

In the expenses under this title have been included land and building taxes, buildings, vehicles as well as machinery and equipment insurance, vehicles annual inspection; postage, telephone and e. mail, stationery and office supplies; printing and copying; audit fee; cash indemnity etc. The overhead costs and divided in to direct overheads and administration overheads.

Table 16 Overhead costs

Direct Overhead"000"Birr		Year 1	Year 2	Year 3	Year 4
Annual land lease Payment		5,550.00	5,550.00	5,550.00	5,550.00
Insurance					
Building and Civil works	0.10%	113.17	113.17	113.17	113.17
Machinery and Equipment	0.20%	135.00	135.00	135.00	135.00
Motor vehicle and Truck	1%	60.00	60.00	60.00	60.00
Vehicles annual inspection and registration	25,000 Birr per annum per vehicle	50.00	50.00	50.00	50.00
Work cloth	Two times per annum per workers at 800 Birr	78.40	78.40	78.40	78.40
Cleaning and sanitation	An estimate of 300 Birr/day	78.00	78.00	78.00	78.00
Sub Total		6,065.00	6,065.00	6,065.00	6,065.00
Administration Overhead "000' Birr					
Audit fee	40,000 Birr per annum	40.00	40.00	40.00	40.00
Office cleaning and sanitation	2,000 Birr per month	24.00	24.00	24.00	24.00
Stationery and office supplies	2,000 Birr per month	20.00	20.00	20.00	20.00
Printing and Copy	2,000 Birr per month	24.00	24.00	24.00	24.00
Sub Total		**108.00**	**108.00**	**108.00**	**108.00**
GRAND TOTAL		**6,173.00**	**6,173.00**	**6,173.00**	**6,173.00**

5.5.6. Financial costs

As it has been outlined earlier under" project Financing" the current Development Bank of Ethiopia credit terms and conditions for newly establishing projects have been used to compute the financial costs, estimated to be incurred in connection with that of the total investment costs assumed to be covered through loan financing. The amount of the loan capital to be obtained and the financial costs to be incurred thereof have been determined depending on the amount of fixed investment cost and pre-production expenses.

5.5.7. Depreciation

Depreciation charges should be taken in to account as part of the total production costs in order to calculate the total production costs, the net working capital and the gross or net-profit. For the given project under reference, the fixed assets and the pre-production capital expenditures have been depreciated and amortized respectively on "a straight line" depreciation method basis using the following rates of the original acquisition costs of the assets:

The rationale uses for the estimation of the depreciation and the amortization rates is based on the expected service life of the assets and repayment capacity of the project under consideration. Based on the above charging rates and consideration of the above facts, the total annual depreciation cost at full capacity operation have been estimated at Birr 18.48 million.

Table 17 Depreciation in Birr"000"

Period			Start-up			
Capacity utilization			70 %	80 %	90 %	100 %
Project year			1	2	3	4
Item description	Original Value					
Structure and civil works	113,170,000.00	5% of original value	5,659.00	5,659.00	5,659.00	5,659.00
Machinery and equipment	67,500,000.00	15 % of original value	10,125.00	10,125.00	10,125.00	10,125.00
Transformer	4,000,000.00	15 % of original value	600.00	600.00	600.00	600.00
Motor vehicles and trucks	6,000,000.00	15 % of original value	900.00	900.00	900.00	900.00
Weighbridge	4,000,000.00	15 % of original value	600.00	600.00	600.00	600.00
Office equipment and furniture	500,000.00	20% of original value	100.00	100.00	100.00	100.00
Pre-operation expense	2,000,000.00	25% of original value	500.00	500.00	500.00	500.00
Total			18,484	18,484	18,484	18,484

5.6. Break Even point and ROI

5.6.1. Break Even point (BEP)

Three kinds of break-even point

A. BEP Sales Revenue(BR)

B. BEP production (Volume)

C. BEP Percentage (%)

A. Break-even point(BEP) Sales

To determine BEP Annual Sales, multiply annual sales found in income statement by the annual fixed cost, and divided by Annual sales less Annual variable cost.

$$\text{BEP (sales)} = = \frac{\text{Annual sales x Annual fixed costs}}{\text{Annual sales} - \text{Annual variables costs}}$$

Annual sales = 210,000,000 Birr

Unit selling price = 15 Birr/pcs

$$\text{BEP (sales)} = = \frac{\text{Annual sales x Annual fixed costs}}{\text{Annual sales} - \text{Annual variables costs}} = = \frac{210{,}000{,}000 \text{ x } 49{,}677{,}000}{210{,}000{,}000 - 75{,}312{,}000}$$

BEP (Sales) = 77,454,339 Birr

B. BEP production

To determine BEP production volume, divided BEP sales by the unit selling price (USP)

BEP production = 77,454,3396/15 = 5,163,623pcs of glass bottle

C. $$\text{BEP percentage} = \frac{\text{Annual fixed costs x 100\%}}{\text{Annual sales} - \text{Annual variables costs}}$$

$$= \frac{49{,}677{,}000 \text{ x } 100\%}{210{,}000{,}000 - 75{,}312{,}000}$$

= 39%

5.6.2. Return on investment

Return on investment = Net profit /Total capital requirement

= 300,000,000/252,772,000

= 118%

The return on owners' investment (ROOI)

= Annual net profit /owners' investment

= 300,000,000/75,831,600

= 395%

5.7. Project costs

Project capital investment costs are the sum of fixed capital investment (fixed investment plus pre-production capital expenses) and net working capital at full capacity, with fixed capital constituting the resources required for constructions and civil works, importation and installation of production machinery (Glass bottle machinery) and equipment and general service facilities, whereas, the working capital corresponding to the resources needed for operation of the project totally and partially.

As it has been revealed in Annex Table 17 the total annual operating costs excluding depreciation and interest are estimated to range from 86.15 million Birr in year 1 to 116.88 million Birr in year 4 and then after remain constant for the rest of the project life.

The total annual production costs including depreciation and interest increase from 124.98 million Birr in year 1 to 151.72 million Birr in year 4 then starts declining until it reaches 125 million Birr in year 10.

5.8. Project benefits

For financial analysis and evaluation of the given project, the current material input price, and packing materials buying price and final packed Glass bottle price at the project gate has been taken as a basis. As it has been stated earlier the project is envisaged to reach full capacity operation four years after commencement of production activities which are assumed to begin with 70% of the estimated total capacity.

At full capacity operation the project is envisaged to have the following revenue components.

Table 18 Source of revenue in Birr"000"

	Period			Start-up			Full Capacity	
	Capacity utilization			70%	80%	90%	100%	100%
	Project year			1	2	3	4	5
	Product type		Unit price					
1	Glass bottle	pcs	15.00	210,000	240,000	270,000	300,000	300,000
	Total			210,000	240,000	270,000	300,000	300,000

Thus, according to the computation in Annex Table 21 and Annex Table 23, the net income and cash flow statements analysis revealed that at full capacity operation the project will generate a total income (gross revenue) amounting to 300 million Birr per annum. The corresponding Annex Table 21 of "Net Income Statement" shows a steady growth of gross profit starting from 85 million Birr in year 1 reaching the peak of 174 million Birr in year 10. In its 10 years of manufacturing activities, the project is expected to generate a total net profit of 937 million Birr and contribute 505 million Birr to the government treasury in form of 35% income tax.

According to the current investment Law, machinery and equipment are anticipated to be imported duty- free. The liquidity position of the project is very strong. The corresponding Annex Table 23 of "Cash Flow Statement" shows the positive cumulative cash balance of Birr 901 million and the project will not face any cash shortage throughout its production life.

The computation of the pay-back period as depicted in Annex table 28 indicates that the project will be able to reimburse itself from its net cash-income within three years after commencement of production activities, the period which is considered to be very good for the project of this nature.

In Annex Table 29 of the Benefit-cost ratio and Net present value (NPV) have been calculated at 17% discount factor (D.F) for 10 years of the project activity. Accordingly, the project has NPV of 542 million Birr at 17%D.F. and the benefit-cost ratio of 1.76 at 17% D.F. These results are most appreciable, especially, when related to the external capital borrowing interest rate which ranges from 8.50% to 18.5 % for newly establishing projects.

The project under study when implemented will have BEP at about 39% operation of the estimated full capacity. In addition to this, finally, summary of financial efficiency tests have been conducted in Annex table 27, Accordingly, all efficiency ratios indicated positive trends and consequently, it can be inferred that the project can operate in the frame work of free market mechanism on commercially and financially viable basis and is remunerative.

ANNEXES

ANNEX II

CALCULATION OF ANNUAL PRODUCTION COSTS

Table 19 Annual total production costs"000"

Period	Start-up			Full capacity						
Capacity utilization	70 %	80 %	90 %	100 %	100 %					
Project Year	1	2	3	4	5	6	7	8	9	10
Cost category										
I. Material inputs	62,205	71,091	79,977	88,864	88,864	88,864	88,864	88,864	88,864	88,864
II. Labor	4,672	4,672	4,672	4,672	4,672	4,672	4,672	4,672	4,672	4,672
III. Utility	3,297	3,752	4,207	4,661	4,661	4,661	4,661	4,661	4,661	4,661
IV. Repair and Maintenance and spare parts (1.5 % of fixed costs)	3,510	3,510	3,510	3,510	3,510	3,510	3,510	3,510	3,510	3,510
VI Direct overheads	6,065	6,065	6,065	6,065	6,065	6,065	6,065	6,065	6,065	6,065
A. Direct Production costs	79,749	89,090	98,431	107,772	107,772	107,772	107,772	107,772	107,772	107,772
VII. Administration over head	108	108	108	108	108	108	108	108	108	108
VIII. Marketing and Promotional expense 3 % of sales revenue	6,300	7,200	8,100	9,000	9,000	9,000	9,000	9,000	9,000	9,000
B. Operating costs	86,157	96,398	106,639	116,880	116,880	116,880	116,880	116,880	116,880	116,880
Interest	20,348	19,160	17,836	16,359	14,712	12,876	10,829	8,547	6,002	3,164
Depreciation	18,484	18,484	18,484	18,484	17,984	17,884	13,813	5,659	5,659	5,659
C. Total production costs	124,989	134,042	142,959	151,723	149,576	147,640	141,522	131,086	128,541	125,703

ANNEX IV
CALCULATION OF WORKING CAPITAL REQUIREMENTS

I. Minimum requirement of current assets and liabilities
   A. Accounts receivable: 30 days at total production costs minus depreciation and interest
   B. Inventory
      1. Material inputs: 30days
      2. Spare parts : 90 days
      3. Work under process: two days at direct costs
      4. Product ready for delivery: 8 days at direct costs plus administration overheads
   C. Cash on hand : 90 days
   D. Accounts payable 52 days for material inputs and utilities

ii. Working capital requirement

Table 20 Calculation of working capital

Cost category	Minimum Days of coverage	Coeff-icient of turnover	Project year									
			Start up			Full capacity						
			1	2	3	4	5	6	7	8	9	10
I. Current asset												
A. A/R	26	10	8,616	9,640	10,664	11,688	11,688	11,688	11,688	11,688	11,688	11,688
B. Inventory												
1. Material inputs	26	10	6,221	7,109	7,998	8,886	8,886	8,886	8,886	8,886	8,886	8,886
2. Spare parts	90	4	878	878	878	878	878	878	878	878	878	878
3. Work under process	2	130	613	685	757	829	829	829	829	829	829	829
4. Product ready for delivery	8	32.5	2,562	2,849	3,137	3,424	3,424	3,424	3,424	3,424	3,424	3,424
C. Cash on hand			4,413	4,527	4,641	4,754	4,754	4,754	4,754	4,754	4,754	4,754
D. Current assets			23,302	25,688	28,073	30,459	30,459	30,459	30,459	30,459	30,459	30,459
II. Current liabilities A. A/p	26	10	6,550	7,484	8,418	9,353	9,353	9,353	9,353	9,353	9,353	9,353
III. Working capital												
A. Net working capital			16,752	18,203	19,655	21,106	21,106	21,106	21,106	21,106	21,106	21,106
B. Increasing in working capital			16,752	1,452	1,452	1,451	0	0	0	0	0	0

ANNEX VI

PROJECTED NET INCOME STATMENT

Table 21 Projected Net income statement "000"

Period	Start up			Full capacity						
Capacity utilization	70 %	80 %	90 %	100 %						
Project year	1	2	3	4	5	6	7	8	9	10
Item description										
Product sales revenue	210,000	240,000	270,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000
Less total production costs	124,989	134,042	142,959	151,723	149,576	147,640	141,522	131,086	128,541	125,703
Gross profit	85,011	105,958	127,041	148,277	150,424	152,360	158,478	168,914	171,459	174,297
Tax	29,754	37,085	44,464	51,897	52,648	53,326	55,467	59,120	60,011	61,004
Net profit	55,257	68,873	82,577	96,380	97,776	99,034	103,011	109,794	111,448	113,293
Accumulated undistributed profit	55,257	124,130	206,707	303,087	400,862	499,896	602,907	712,701	824,149	937,442

ANNEX VII
DEBT SERVICE SCHEDULE AND COMPUTATION
PAYMENT OF EQUAL ANNUAL INSTALLMENTS

Table 22 Debt services schedule and computation

Item description	Project year									
	1	2	3	4	5	6	7	8	9	10
A. Investment and working capital										
1. Investment										
2. Increment working capital										
Total										
B. Loan receipts and balances										
1. Loan receipts	176,940									
2. Outstanding balance at end of year										
a. First year loan	176,940	166,611	155,094	142,252	127,934	111,969	94,168	74,320	52,189	27,513
Total										
A. Debt service										
1. First year Loan										
a. Interest	20,348	19,160	17,836	16,359	14,712	12,876	10,829	8,547	6,002	3,164
b. Repayment of principal	10,329	11,517	12,842	14,318	15,965	17,801	19,848	22,131	24,676	27,513

ANNEX VIII
CASH-FLOW STATEMENT
FOR
FINANCIAL PLANING

Table 23 Projected Cash flow statement

Period	Start up			Full capacity						
Capacity utilization	70%	80%	90%	100%						
Project year	1	2	3	4	5	6	7	8	9	10
Item description										
A. Cash - inflow	469,322	242,386	272,385	302,386	300,000	300,000	300,000	300,000	300,000	300,000
1. Financial resource (total)	259,322	2,386	2,385	2,386						
2. Sales revenue	210,000	240,000	270,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000
B. Cash – outflow	405,910	166,546	184,166	201,840	200,205	200,883	203,024	206,678	207,569	208,561
1. Total assets schedule including replacement	259,322	2,386	2,385	2,386						
2. Operating costs	86,157	96,398	106,639	116,880	116,880	116,880	116,880	116,880	116,880	116,880
3. Debt service (total)										
a. Interest	20,348	19,160	17,836	16,359	14,712	12,876	10,829	8,547	6,002	3,164
b. Repayment	10,329	11,517	12,842	14,318	15,965	17,801	19,848	22,131	24,676	27,513
4. Tax	29,754	37,085	44,464	51,897	52,648	53,326	55,467	59,120	60,011	61,004
C. Surplus (Deficit)	63,412	75,840	88,219	100,546	99,795	99,117	96,976	93,322	92,431	91,439
D. Cumulative cash balance	63,412	139,252	227,471	328,017	427,812	526,929	623,905	717,227	809,658	901,097

ANNEX XII
TOTAL INVESTMENT COSTS

Table 24 Total investment costs"000"

Period	Start up			Full capacity								
Project year	1	2	3	4	5	6	7	8	9	10	11	
Investment Category												
1. Fixed investment costs												
a. Initial fixed investment costs	234,020											
b. Replacement												
2. Pre-operational capital expenditure	2,000											
3. Working capital increase	16,752	1,452	1,452	1,452								
Total investment costs	252,772	1,452	1,452	1,452								

ANNEX XIII
TOTAL ASSETS

Table 25 Total Assets

Period	Start up			Full capacity								
Project year	1	2	3	4	5	6	7	8	9	10	11	12
Investment Category												
1. Fixed investment costs												
c. Initial fixed investment costs	234,020											
❖ Cost of land												
d. Replacement												
2. Pre-operational capital expenditure	2,000											
3. Current assets increase	23,302	2,386	2,385	2,386								
Total assets	259,322	2,386	2,385	2,386								

ANNEX XIV
SOURCES OF FINANCE

Table 26 Sources of finance

Period	Start up			Full capacity							
Project year	1	2	3	4	5	6	7	8	9	10	Total
Sources of finance											
1. Equity capital	75,832	1,452	1,452	1,452							
2. Loan capital	176,940										
3. Current liabilities	6,550	934	934	935							
Total finance	259,322	2,386	2,386	2,386							

ANNEX XI
SUMMARY OF FINANCIAL EFFECIENCY TESTS

Table 27 Summary of financial efficiency tests

	Project year									
Project year	1	2	3	4	5	6	7	8	9	10
Capacity utilization	70%	80%	90%	100%						
Financial ratio in %										
1. Gross profit : Revenue	40%	44%	47%	49%	50%	51%	53%	56%	57%	58%
2. Net profit : Revenue	26%	29%	31%	32%	33%	33%	34%	37%	37%	38%
3. Net profit : initial investment	31%	39%	46%	53%	54%	55%	57%	61%	61%	62%
4. Net profit : Equity	73%	89%	105%	120%	122%	124%	128%	137%	139%	141%
5. Gross profit : Initial investment	48%	59%	71%	82%	83%	84%	87%	93%	95%	96%
6. Operating costs : Revenue	41%	40%	39%	39%	39%	39%	39%	39%	39%	39%

ANNEX XV

CALCULATIONS OF PAYBACK PERIOD

Table 28 Calculation of payback period"000"

Year	Amount Paid Back			Total investment	End of year
	Net Profit	Depreciation	Total		
1	55,257	18,484	73,741	252,772	-179,031
2	68,873	18,484	87,357	1,452	-93,126
3	82,577	18,484	101,061	1,452	+6,483

ANNEX XVI
CALCULATIONS OF NET PRESENT VALUE AT 17% D.F.

Table 29 Calculation of NPV at 17% D.F.

Project year	Gross Revenue	$1/(1+i)^n$ At 17%	Present value at 17%	Project costs			
				Total investment	Operating costs	Total	Present value at 17%
1	210,000	0.854701	179,487	252,772	86,157	338,929	289,683
2	240,000	0.730514	175,323	1,452	96,398	97,850	71,481
3	270,000	0.624371	168,580	1,452	106,639	108,091	67,489
4	300,000	0.53365	160,095	1,452	116,880	118,332	63,148
5	300,000	0.456111	136,833		116,880	116,880	53,310
6	300,000	0.389839	116,952		116,880	116,880	45,564
7	300,000	0.333195	99,959		116,880	116,880	38,944
8	300,000	0.284782	85,435		116,880	116,880	33,285
9	300,000	0.243404	73,021		116,880	116,880	28,449
10	300,000	0.208037	62,411		116,880	116,880	24,315
Total			1,258,096				715,669

A. Benefit- cost ratio At 17% D.F. = 1.76

B. NPV At 17% D.F. = 542,427,000 Birr