



PROJECT PROFILE ON INDUSTRIAL ADHESIVE PRODUCTION



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ADDIS ABEBA CITY ADMINISTRATION INVESTMENT COMMISSION
A.A.

PROJECT PROFILE ON INDUSTRIAL ADHESIVE PRODUCTION

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I. Executive summary

This project profile is prepared to assess the viability of running Industrial adhesive 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 Industrial adhesive 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 Industrial adhesive industry. According to the latest data sourced from Ethiopian investment commission there are 11 registered companies to invest on industrial adhesive and related products in Ethiopia.

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 most locally available raw materials for the factory are corn starch, caustic soda, borax and etc.

The factory at full capacity operation can produce 5,000,000 kg of industrial adhesive, 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 225.73 million. Out of the total investment capital, the owners will cover Birr 67.72 million (30 %) while the remaining balances amounting to Birr 158.01 million (70 %) will be secured from bank in the form of term loan.

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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 49.97 Million in the first year to Birr 72.70 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 720.50 million. 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 426.40 million Birr at 17%D.F. and the benefit-cost ratio of 1.68 at 17% D.F.

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

1. BACKGROUND INFORMATION

1.1 Introduction

This document was undertaken to show industrial adhesive production sector 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.

In Ethiopia due to the growth of different sectors particularly the present housing construction activities, wood working, textile industries, and shoe industries, there is a high demand for adhesive.

The provision of adequate adhesive is of fundamental importance to Ethiopian's present and future demand. In Ethiopia, the demand for industrial adhesive is expected to increase considerably in the next few decades as a result of increased population growth, urbanization and increasing income levels. The country demand for industrial adhesive is met through import from different countries.

1.2 Product Description and Application

An adhesive is any non-metallic material that is capable of joining bodies together by surface adhesion and internal strength without the structure of the bodies undergoing significant changes .

Adhesives are gluing materials which are directly extracted either from natural sources such as bone, gums and starches or synthetically derived from chemicals like urea formaldehyde (Packham, 2005).

Adhesion is the state in which two surfaces are held together by interfacial forces, which may be valence forces, interlocking action, or both while an adherent is a substrate held to another substrate by an adhesive (Mwambusi, 2016) .

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Adhesives are everywhere in the highly technological manufacturing world today, and it is no surprise that adhesives are one of the most important substances used in industry (Frihart, 2005).

The main areas using industrial adhesives are the following:

Construction: floor tile and continuous flooring installation, ceramic tile installation, countertop lamination, manufacture of prefabricated beams and trusses, carpet adhesives, flooring underlayment adhesives, installation of prefinished panels, joint cements, drywall lamination adhesives and covering installations.

Consumer adhesives: model and hobby supplies, decorative films, school and stationery products.

Packaging: carton-side seam and closures, composite bonding of disposable products, bags, labels, cups, cigarette and filter manufacture, specialty packages (cosmetics, toiletries), composite containers and tubes.

Tapes: packaging, industrial, surgical, masking, and consumer tapes.

Transportation: auto, truck and bus assemblies, weather strip and gasket bonding, aircraft and aerospace structural assemblies.

Other rigid bonding: shake-proof fastening; furniture manufacture; manufacture of millwork, doors, and kitchen cabinets; appliance assembly and trim attachment; TV, radio and electronics assembly and machinery manufacture and assembly.

Other non-rigid bonding: apparel laminates; shoe assembly, sports equipment, book binding, rug backing, flock cements, air and liquid filter manufacture.

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 9°1'48''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 km² of which 18.2 km² are rural. Addis Ababa's built-up urban area spans 474 km². 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

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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

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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.

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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 Carry 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

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Investment is expected to provide direct and indirect employment. These range from unskilled casual 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 Industrial Adhesive

2.2.1 Local Supply

The demand for industrial adhesive in Ethiopia is entirely met through import. Thus, there is no production company involved in producing adhesive in the country.

2.2.2 Import

In our country Ethiopia due to the growth of different sectors particularly the present housing construction activities, wood working, textile industries, and shoe industries, there is a high demand for adhesive. Most of the country`s requirement of industrial adhesive is met through import. A summary of adhesives imported during the period 2012 – 2021 is presented in table 1. Imported Adhesive is used in paper, corrugated cardboard, gypsum wall board, paper bags, single and multi-wall, carton and case sealing, paper and board tube winding, laminated paper board, gummed tape

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and paper (wallpaper), textile sizing, pharmaceuticals and personal care products, Paints, inks and toners manufacturing.

Table 1: Industrial Adhesive import from 2012 to 2021

Year	Quantity (Tons)	Value (`000 Birr)
2012	5,338.58	187,618.45
2013	7,075.90	240,014.42
2014	21,945.42	301,118.38
2015	7,931.28	347,881.66
2016	4,166.33	184,893.43
2017	8,493.62	372,033.05
2018	2,845.22	156,659.28
2019	0.06	50.76
2020	6,862.11	485,100.78
2021	6,327.89	648,326.63

Sources: Ethiopian Revenue and customs Authority, compiled by consultant

As shown in table 1, import of industrial adhesive has been growing from year to year with major fluctuations. During the past 10 years import volume has shown an annual average growth rate (CAGR) of 2%.

In terms of value, the country was on the average spending 242.9 million Birr during the period 2012-2014. The expenditure for importing adhesives has increased to annual average of Birr 301.6 million during the period 2015-2017. During the recent two years (2020 & 2021), the annual expenditure for importing adhesives has reached to a level of Birr 566.7 million. The increase for the demand of adhesives is believed to be due to the establishment of a number of end user industries.

In estimating the current effective demand for adhesives, it is considered as reasonable to assume that the present demand for the product would be the average of the imported quantity of the recent

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two years i.e. year 2020 and 2021. Accordingly, the present (year 2022) effective demand for adhesives is estimated at 6,595 tons.

2.3 Industrial Adhesive Demand Projection

Adhesives are a group of substances that allow you to bind together different materials and surfaces, making them impossible to separate. They belong to the group of materials which modify the glued surface, the most important feature of which is to increase adhesion.

As per the data of the Ethiopian Investment Commission, there are a number of chemical projects which are licensed for implementation of industrial adhesives production. When the projects become operational the supply for the product will undoubtedly increase significantly. By considering the past trend, which was 2% annual import growth rate and future prospects of the industrial sector demand for adhesives is assumed conservatively to grow by 5% per annum.

The total demand projection worked based on the above assumptions is presented in table 2.

Table 2: Projected demand for industrial adhesive in Ethiopia

Year	Adhesive
2023	6,644
2024	6,976
2025	7,325
2026	7,692
2027	8,076
2028	8,480
2029	8,904
2030	9,349
2031	9,817
2032	10,307

As it is indicated in table 3, the demand for industrial adhesive will grow from 6,644 tons in the year 2023 to 8,076 tons and 10,307 tons by the year 2027 and year 2032, respectively.

3. Production Technology and engineering

3.1 Technology

Adhesives are a group of substances that allow you to bind together different materials and surfaces, making them impossible to separate. They belong to the group of materials which modify the glued surface, the most important feature of which is to increase adhesion.

Adhesive substances are usually in liquid form. However, you can also find a solid form, e.g. powder, pearls, sticks or cartridges, forming a weld after melting. Its strength depends on several factors: cohesion, adhesion, shape and thickness of the adhesive layer, as well as on the so-called depth of penetration of the material by an adhesive substance. The most important is the adhesion and cohesion that affect the type and strength of the chemical interaction of the adhesive with the bonded surfaces, as well as the mechanical strength of the adhesive layer itself. Adequate selection of glue for the type and size of materials that are to be bonded makes it relatively easy to glue them together.

A Starch Suspension in water is fed into a pressurized System in which the Starch is heated, melted, and then cooled. The physically altered composition is then removed from the pressure Zone and comprises an adhesive ready for use, or for further compounding. Gelatinized Starch can be processed as shown, but it will normally be preferred that the feed be an essentially un-gelatinized Starch composition. Essentially any formulation of Starch, from any Starch Source, can be used in the process. Normal corn Starch is preferred in many instances because of its low cost and good availability, but other starches can be utilized for their economy or to alter the characteristics of the product adhesive. The process is highly amenable to the use of known additives of many types Such

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as inert additives for economy, plasticizers, tackifiers, additives for water resistance or water Solubility, and the like. The process is usable over a very broad range of Starch Solids, covering at least the range of 20% to 80% starch solids. Further, it is quite easy to adjust the Solids level up or down within the process. The product can also be further compounded in any way desired, Such as mixing with another adhesive, or mixing with gelatinized or un-gelatinized Starch. The process flow for the industrial adhesive is presented in figure 1.

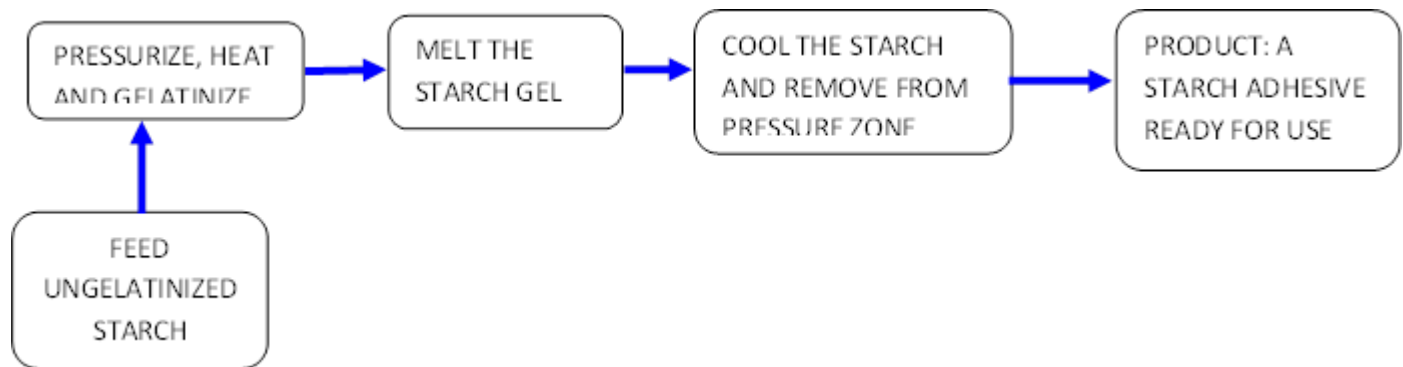


Figure 1: Industrial adhesive production process flow diagram

3.1.1 Environmental and Social Impact Assessment

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 of industrial adhesive. Potential environmental and social impacts due to the production of industrial adhesive 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. Social responsibility cost estimated to be 1% of fixed investment costs.

3.1.2 Plant capacity and Production program

The plant is proposed to produce 1,000 tons per annum of starch based industrial adhesive considering the market study, minimum economies of scale, investment cost, period for implementation and full capacity attainment. The plant will operate single shifts of 8 hours each per day for 300 days in a year.

In determining the plant capacity of the adhesives production plant, the future demands of the product and the economies of scale of the available technologies were taken into consideration. According to the data obtained from the market study, the demand for adhesives raises from 6,644 tons to 10,307 tons from years 2023 to 2032.

The plant is expected to operate at 70% of its rated full capacity at the beginning and will grow by 10% each year considering the market penetration traits and consumer perception for local products. The production program of the envisaged plant is given in table 3.

Table 3: Adhesive production program

Year of Production	1st Year	2nd Year	3rd Year	4th -10th Year
Capacity utilization	70%	80%	90%	100%
Adhesives (Tons)	3,500	4,000	4,500	5,000

3.1.3 Materials and inputs

Raw and Auxiliary Materials

The principal raw materials required for the selected process are starch and Water. The materials and inputs required by the adhesives plant comprise basic raw materials, auxiliary raw materials and utilities.

The total annual cost of raw material is estimated at Birr 72,258,200 which is locally available. The annual requirement of this raw material is shown in table 4.

Table 4: Annual raw & auxiliary materials requirement and cost

Sr. No.	Description	Unit	Quantity	Unit cost	Total cost (` 000 Birr)
1	Corn Starch	Kg	900,000	50.00	45,000,000.00
2	Water	Liter	4,250,000	1.00	4,250,000.00
3	Sodium hydroxide (Caustic acid)	Kg	32,000	80.00	2,560,000.00
4	Aluminum sulfate octadechydrate	Kg	6,600	77.00	508,200.00
5	Borax	Kg	26,000	190.00	4,940,000.00
6	Packing material	Pcs	1,000,000	15	15,000,000.00
	Total				72,258,200.00

3.2 Engineering

3.2.1 Land, buildings and civil works

The required area (m²) and construction cost for the production facilities essential for the successful operation of the processing plant is shown in Table 5. A total area ready for the processing plant is 10,000 m² out of which 4,670 m² is to be covered by building while uncovered area of 5,330m² is left 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 M² to 2,800.71 birr per M² respectively. Therefore, for the profile a land lease rate of birr 3,885 per M² 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 10,000.00 Birr per m² to 25,000.00 Birr per m². The total construction cost of buildings and civil works, at a rate of Birr 20,000 per m² is estimated at Birr 93.10 million. Therefore, the total cost of land lease and construction of buildings and civil works is estimated at Birr 131.95 million.

The proposed plant layout comprises the following buildings and structures.

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Table 5 Building costs

S/No	Descriptions	Total area in M ²	Estimated cost per square meter (in Birr)	Total estimated cost (in Birr)
1	Raw materials receiving and store	1,000	20,000.00	20,000,000.00
2	Production room	150	20,000.00	3,000,000.00
3	Ingredients store	500	20,000.00	10,000,000.00
4	Filling and packing room	500	20,000.00	10,000,000.00
5	Packing materials store	500	20,000.00	10,000,000.00
6	Final products store	500	20,000.00	10,000,000.00
7	Finished products delivery veranda	100	20,000.00	2,000,000.00
8	Boiler room	100	20,000.00	2,000,000.00
9	workshop	120	20,000.00	2,400,000.00
10	Generator room	20	20,000.00	400,000.00
11	Power station room	20	20,000.00	400,000.00
12	Administration office 5,360=13,400,000	300	20,000.00	6,000,000.00
13	Production and technical office	200	20,000.00	4,000,000.00
14	Toilet and shower for female	40	20,000.00	800,000.00
15	Room for cloth changing for female	40	20,000.00	800,000.00
16	Toilet and shower for male	40	20,000.00	800,000.00
17	Room for cloth changing for male	40	20,000.00	800,000.00
18	parking	500	5,000.00	2,500,000.00
19	Fence	1,200 M*2	3,000.00	7,200,000.00
	TOTAL	4,670 M²		93,100,000.00

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Table 6 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 7 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

One of the core machines in starch based adhesive production is the Heated Wall Reactor. The total cost of machinery and equipment is estimated at about Birr 64 million. Lists of required machinery and equipment are shown in table 8.

Table 8: List of machineries and equipment's for adhesive production

S/N	Description	UOM	Number of Equipment	Unit Cost of Equipment(Birr)	Total Cost of the Equipment(Birr)
1	Mixing tank	pcs	1	4,500,000.00	4,500,000.00
2	Centrifugal/ Positive Displacement Pump	“	1	1,500,000.00	1,500,000.00
3	Heated Wall Reactor	“	1	15,000,000.00	15,000,000.00
4	Heat Exchanger	“	2	4,500,000.00	9,000,000.00
5	Discharge Device	“	1	1,500,000.00	1,500,000.00
6	Product Storage Tank	“	2	5,000,000.00	10,000,000.00
7	Boiler	“	1	7,500,000.00	7,500,000.00
8	Other accessories		Lump sum		15,000,000.00
Total					64,000,000.00

3.2.3. lists of machinery suppliers

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4. 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

Description	Number	Monthly salary	Annual salary, Birr
plant manager	1	30,000.00	360,000.00
Administration and finance manager	1	15,000.00	180,000.00
Human resource manager	1	7,500.00	90,000.00
Secretary	1	5,000.00	60,000.00
Marketing and sales officer	1	10,000.00	120,000.00
Sales manager	1	15,000.00	180,000.00
Accountant	1	10,000.00	120,000.00
Production unit leader	1	15,000.00	180,000.00
Senior Mechanic	3	10,000.00	360,000.00
Senior Electrician	3	10,000.00	360,000.00
Purchaser	1	10,000.00	120,000.00
Operator	16	4,000.00	704,000.00
Ass. Operator	16	2,000.00	352,000.00
Store keeper	2	5,000.00	120,000.00
Quality manager	1	15,000.00	180,000.00
Microbiologist	1	10,000.00	120,000.00
Sugar dissolving team	1	6,000.00	72,000.00
Boiler technician	1	3,000.00	36,000.00
Guard	4	1,400.00	67,200.00
Driver	1	3,000.00	36,000.00
Cleaners	12	1,500.00	216,000.00
Sub total	70		4,033,200.00
Grand total			4,865,200.00

5. Financial Analysis

5.1 General

The financial analysis evaluation of industrial adhesive manufacturing project is 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, manpower cost, 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.
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

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most of the capital assets are assumed to be depreciated, 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.
7. Furniture and fixture costs assumed to be 500,000.00

5.2 Initial Fixed investment costs

Table 9 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	5,670	lump sum	93,100,000.00	
	Sub total				131,950,000.00	
3	Machineries	set	2	Lump sum	64,000,000.00	
4	Transformer	set	1	Lump sum	2,000,000.00	
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				76,500,000.00	
	Fixed capital investment costs				208,450,000.00	
8	pre-operational expenses				2,000,000.00	
	Working capital				15,283,000.00	
	TOTAL INVESTMENT COSTS				225,733,000.00	

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.

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. The remaining balance 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 13 major categories of the total production costs are assembled into the following cost elements.

5.5.1 Material inputs

In the project under study the basic material inputs (see in table 4) are corn starch, caustic soda, borax and aluminum sulphate and, packing materials etc. Therefore, the current prevailing local and international market prices have been used for estimation of material inputs costs. At full capacity operation the material inputs costs are estimated at Birr 72.258 million per annum.

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 6.089 million.

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Table 10 Utilities of the factory'000''Birr

Utility''000''Birr		Start-up			Full Capacity
		70 %	80 %	90 %	100 %
Project year		1	2	3	4
Item description	Unit of measurement				
Fuel					
Gasoline for service vehicle	100km*260days*32Birr/LIT*8km/Li	104	104	104	104
Gasoline for transport truck	(200km*300days*32Birr/LIT*5km/Li)*3	1,152	1,152	1,152	1,152
Sub-Total		1,256	1,256	1,256	1,256
Change of oil and lubricant	10% of the fuel consumption	126	126	126	126
Sub-Total		1,382	1,382	1,382	1,382
Electricity	260days*24 hrs*650kwh* 1.00Birr/kwh	2,839	3,245	3,650	4,056
Sub- Total		2,839	3,245	3,650	4,056
Water	365days*100m ³ /day*15 Birr/m ³	384	438	493	548
Sub -Total		384	438	493	548
Telecommunication					
Telephone	5 lines* 1,500Birr/month/line+18Birr/line/month	31.08	31.08	31.08	31.08
Mobile	5 lines*1,500 Birr/month/line	30.00	30.00	30.00	30.00
Fax	2line*1,000Birr/month + 17 Birr/line/month	12.40	12.40	12.40	12.40
Internet	2,500 Birr/month	30.00	30.00	30.00	30.00
Sub-Total		103.48	103.48	103.48	103.48
TOTAL		<u>4,708.48</u>	<u>5,168.48</u>	<u>5,628.48</u>	<u>6,089.48</u>

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5.5.3 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 11 Overhead costs

Direct Overhead”000”Birr		Year 1	Year 2	Year 3	Year 4
Annual land lease Payment		5,550	5,550	5,550	5,550
Insurance					
Building and Civil works	0.10%	113.10	113.10	113.10	113.10
Machinery and Equipment	0.20%	94.50	94.50	94.50	94.50
Motor vehicle and Truck	1%	60	60	60	60
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 1,000 Birr	140	140	140	140
Cleaning and sanitation	An estimate of 300 Birr/day	78.00	78.00	78.00	78.00
Sub Total		6,085.60	6,085.60	6,085.60	6,085.60
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		6,193.60	6,193.60	6,193.60	6,193.60

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5.5.4 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.

5.5.5 Depreciation

Table 12 Depreciation in Birr"000"

Period			Start-up			
			70 %	80 %	90 %	100 %
Capacity utilization			1	2	3	4
Project year						
Item description	Original Value					
Structure and civil works	93,100,000.00	5% of original value	4,655	4,655	4,655	4,655
Machinery and equipment	64,000,000.00	15 % of original value	9,600	9,600	9,600	9,600
Transformer	2,000,000.00	15 % of original value	300	300	300	300
Motor vehicles and trucks	6,000,000.00	15% of original value	900	900	900	900
Weighbridge	4,000,000.00	15 % of original value	600	600	600	600
Office equipment and furniture	500,000.00	20 % of original value	100	100	100	100
Pre-production expenses	2,000,000.00	25% of original value	500	500	500	500
Total			16,655	16,655	16,655	16,655

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.

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

Annual sales = 175,000,000Birr

Unit selling price = 250 Birr/PCS

$$\text{BEP (sales)} = \frac{\text{Annual sales} \times \text{Annual fixed costs}}{\text{Annual sales} - \text{Annual variables costs}} = \frac{175,000,000 \times 45,886,000}{175,000,000 - 63,667,000}$$

BEP (Sales) = 72,126,414 Birr

B. BEP production

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

BEP production = $72,126,414 / 250 = 288,506$ psc of 5kg

$$\begin{aligned} \text{c. BEP percentage} &= \frac{\text{Annual fixed costs} \times 100\%}{\text{Annual sales} - \text{Annual variables costs}} \\ &= \frac{45,886,000 \times 100\%}{175,000,000 - 63,667,000} \\ &= 41\% \end{aligned}$$

5.6.2 Return on investment

Return on investment = Net profit /Total capital requirement

$$= 77,156,000/225,733,000$$

$$= 34\%$$

The return on owners' investment (ROOI)

= Annual net profit /owners' investment

$$= 77,156,000/67,719,900$$

$$= 114\%$$

5.7 Project benefits

For financial analysis and evaluation of the given project, the current raw price, and packing materials buying price and final packed Adhesive price at the project gate has been taken as a basis. Consequently, based on the recent market survey, price has been indicated in table 4.

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.

Thus, according to the computation in Annex Table 15 and Annex Table 17, 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 250 million Birr per annum. The Net Income Statement shows a steady growth of gross profit starting from 65.44 million Birr in year 1 reaching the peak of 142.80 million Birr in year 10. In its 10 years of manufacturing activities, the project is expected to generate

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a total net profit of 753.50 million Birr and contribute 405.70 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 17 of “Cash Flow Statement” shows the positive cumulative cash balance of Birr720.50 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 22 indicates that the project will be able to reimburse itself from its net cash-income within four years after commencement of production activities, the period which is considered to be very good for the project of this nature.

In Annex Table 23 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 426.40 million Birr at 17%D.F. and the benefit-cost ratio of 1.68 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.

Break-even point (BEP) have been undertaken the project under study when implemented will have BEP at about 41% operation of the estimated full capacity

In addition to this, finally, summary of financial efficiency tests have been conducted in Annex table 21, 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

PROJECT PROFILE ON INDUSTRIAL ADHESIVE PRODUCTION

CALCULATION OF ANNUAL PRODUCTION COSTS

Table 13 Annual total production costs''000''

Period	Start-up			Full capacity						
	70 %	80 %	90 %	100 %	100 %					
Project Year	1	2	3	4	5	6	7	8	9	10
Cost category										
I. Material inputs including packing materials	50,581	57,806	65,032	72,258	72,258	72,258	72,258	72,258	72,258	72,258
II. Labor	4,865	4,865	4,865	4,865	4,865	4,865	4,865	4,865	4,865	4,865
III. Utility	4,709	5,169	5,629	6,090	6,090	6,090	6,090	6,090	6,090	6,090
IV. Repair and Maintenance and spare parts (1.5 % of fixed costs)	3,127	3,127	3,127	3,127	3,127	3,127	3,127	3,127	3,127	3,127
VI Direct overheads	6,086	6,086	6,086	6,086	6,086	6,086	6,086	6,086	6,086	6,086
A. Direct Production costs	69,368	77,053	84,739	92,426	92,426	92,426	92,426	92,426	92,426	92,426
VII. Administration over head	108	108	108	108	108	108	108	108	108	108
VIII. Marketing and Promotional expense 3 % of sales revenue	5,250	6,000	6,750	7,500	7,500	7,500	7,500	7,500	7,500	7,500
B. Operating costs	74,726	83,161	91,597	100,034	100,034	100,034	100,034	100,034	100,034	100,034
Interest	18,172	17,111	15,928	14,609	13,139	11,499	9,671	7,633	5,360	2,826
Depreciation	16,655	16,655	16,655	16,655	16,155	16,055	12,259	4,655	4,655	4,655
C. Total production costs	109,553	116,927	124,180	131,298	129,328	127,588	121,964	112,322	110,049	107,515

PROJECT PROFILE ON INDUSTRIAL ADHESIVE PRODUCTION

ANNEX IV CALCULATION OF WORKING CAPITAL REQUIREMENTS

- I. Minimum requirement of current assets and liabilities
 - A. Accounts receivable: 26 days at total production costs minus depreciation and interest
 - B. Inventory
 - 1. Material inputs: 26 days
 - 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 : 360 days
 - D. Accounts payable 26 days for material inputs and utilities

ii. Working capital requirement

Table 14 Calculation of working capital

Cost category	Minimum Days of coverage	Coeff-icent 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	7,473	8,316	9,160	10,003	10,003	10,003	10,003	10,003	10,003	10,003
B. Inventory												
1. Material inputs	26	10	5,058	5,781	6,503	7,226	7,226	7,226	7,226	7,226	7,226	7,226
2. Spare parts	90	4	782	782	782	782	782	782	782	782	782	782
3. Work under process	2	130	534	593	652	711	711	711	711	711	711	711
4. Product ready for delivery	8	32.5	2,242	2,479	2,715	2,952	2,952	2,952	2,952	2,952	2,952	2,952
C. Cash on hand	90	4	4,724	4,839	4,954	5,069	5,069	5,069	5,069	5,069	5,069	5,069
D. Current assets			20,812	22,789	24,766	26,743	26,743	26,743	26,743	26,743	26,743	26,743
II. Current liabilities	26	10	5,529	6,298	7,066	7,835	7,835	7,835	7,835	7,835	7,835	7,835
A. A/p												
III. Working capital												
A. Net working capital			15,283	16,491	17,699	18,908	18,908	18,908	18,908	18,908	18,908	18,908
B. Increasing in working capital			15,283	1,208	1,208	1,209	0	0	0	0	0	0

PROJECT PROFILE ON INDUSTRIAL ADHESIVE PRODUCTION

ANNEX V

PROJECTED SALES REVENUE

Period					Start up			Full capacity						
					70 %	80 %	90 %	100 %						
Capacity utilization		U/m	Quantity at full capacity	Unit price										
Item description	Product mix													
Project year					1	2	3	4	5	6	7	8	9	10
Industrial adhesive	Will be packed in 5kg plastic container	Pcs	1,000,000	250	175,000	200,000	225,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000
GRAND TOTAL					175,000	200,000	225,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000

PROJECT PROFILE ON INDUSTRIAL ADHESIVE PRODUCTION

ANNEX VI

PROJECTED NET INCOME STATEMENT

Table 15 Projected Net income statement "000"

Period	Start up			Full capacity						
	70 %	80 %	90 %	100 %						
Project year	1	2	3	4	5	6	7	8	9	10
Item description										
Product sales revenue	175,000	200,000	225,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000
Less total production costs	109,553	116,927	124,180	131,298	129,328	127,588	121,964	112,322	110,049	107,515
Gross profit	65,447	83,073	100,820	118,702	120,672	122,412	128,036	137,678	139,951	142,485
Tax	22,906	29,076	35,287	41,546	42,235	42,844	44,813	48,187	48,983	49,870
Net profit	42,541	53,997	65,533	77,156	78,437	79,568	83,223	89,491	90,968	92,615
Accumulated undistributed profit	42,541	96,538	162,071	239,227	317,664	397,232	480,455	569,946	660,914	753,529

PROJECT PROFILE ON INDUSTRIAL ADHESIVE PRODUCTION

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

Table 16 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	158,013	148,789	138,504	127,036	114,249	99,992	84,095	66,370	46,606	24,570
2. Outstanding balance at end of year										
a. First year loan	158,013	148,789	138,504	127,036	114,249	99,992	84,095	66,370	46,606	24,570
Total										
A. Debt service										
1. First year Loan										
a. Interest	18,172	17,111	15,928	14,609	13,139	11,499	9,671	7,633	5,360	2,826
b. Repayment of principal	9,224	10,285	11,468	12,787	14,257	15,897	17,725	19,763	22,096	24,570

PROJECT PROFILE ON INDUSTRIAL ADHESIVE PRODUCTION

ANNEX VIII CASH-FLOW STATEMENT FOR FINANCIAL PLANING

Table 17 Projected Cash flow statement

Period	Start up				Full capacity						
	70%	80%	90%	100%							
Capacity utilization											
Project year	1	2	3	4	5	6	7	8	9	10	
Item description											
A. Cash - inflow	406,262	201,977	226,977	251,977	250,000	250,000	250,000	250,000	250,000	250,000	
1. Financial resource (total)	231,262	1,977	1,977	1,977							
2. Sales revenue	175,000	200,000	225,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	
B. Cash – outflow	356,290	141,610	156,257	170,953	169,665	170,274	172,243	175,617	176,473	177,300	
1. Total assets schedule including replacement	231,262	1,977	1,977	1,977							
2. Operating costs	74,726	83,161	91,597	100,034	100,034	100,034	100,034	100,034	100,034	100,034	
3. Debt service (total)											
a. Interest	18,172	17,111	15,928	14,609	13,139	11,499	9,671	7,633	5,360	2,826	
b. Repayment	9,224	10,285	11,468	12,787	14,257	15,897	17,725	19,763	22,096	24,570	
4. Tax	22,906	29,076	35,287	41,546	42,235	42,844	44,813	48,187	48,983	49,870	
C. Surplus (Deficit)	49,972	60,367	70,720	81,024	80,335	79,726	77,757	74,383	73,527	72,700	
D. Cumulative cash balance	49,972	110,339	181,059	262,083	342,418	422,144	499,901	574,284	647,811	720,511	

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ANNEX XII TOTAL INVESTMENT COSTS

Table 18 Total investment costs”000”

Period	Start up			Full capacity								
	1	2	3	4	5	6	7	8	9	10		11
Project year												
Investment Category												
1. Fixed investment costs												
a. Initial fixed investment costs	208,450											
b. Replacement												
2. Pre-operational capital expenditure	2,000											
3. Working capital increase	15,283	1,208	1,208	1,209								
Total investment costs	225,733	1,208	1,208	1,209								

ANNEX XIII TOTAL ASSETS

Table 19 Total Assets

Period	Start up			Full capacity									
	1	2	3	4	5	6	7	8	9	10		11	12
Project year													
Investment Category													
1. Fixed investment costs													
c. Initial fixed investment costs	208,450												
❖ Cost of land													
d. Replacement													
2. Pre-operational capital expenditure	2,000												
3. Current assets increase	20,812	1,977	1,977	1,977									
Total assets	231,262	1,977	1,977	1,977									

PROJECT PROFILE ON INDUSTRIAL ADHESIVE PRODUCTION

ANNEX XIV SOURCES OF FINANCE

Table 20 Sources of finance

Period	Start up			Full capacity						Total	
	1	2	3	4	5	6	7	8	9		10
Project year											
Sources of finance											
1. Equity capital	67,720	1,208	1,208	1,209							
2. Loan capital	158,013										
3. Current liabilities	5,529	769	768	769							
Total finance	231,262	1,977	1,976	1,977							

ANNEX XI SUMMARY OF FINANCIAL EFFECIENCY TESTS

Table 21 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	37%	42%	45%	47%	48%	49%	51%	55%	56%	57%
2. Net profit : Revenue	24%	27%	29%	31%	31%	32%	33%	36%	36%	37%
3. Net profit : initial investment	27%	34%	41%	48%	49%	49%	51%	55%	56%	57%
4. Net profit : Equity	63%	78%	93%	108%	110%	112%	117%	125%	128%	130%
5. Gross profit : Initial investment	41%	52%	63%	73%	75%	76%	79%	85%	87%	88%
6. Operating costs : Revenue	43%	42%	41%	40%	40%	40%	40%	40%	40%	40%

PROJECT PROFILE ON INDUSTRIAL ADHESIVE PRODUCTION

ANNEX XV CALCULATIONS OF PAYBACK PERIOD

Table 22 Calculation of payback period”000”

Year	Amount Paid Back			Total investment	End of year
	Net Profit	Depreciation	Total		
1	42,541	16,655	59,196	225,733	-166,537
2	53,997	16,655	70,652	1,208	-97,093
3	65,533	16,655	82,188	1,208	-16,113
4	77,156	16,655	93,811	1,209	+76,489

PROJECT PROFILE ON INDUSTRIAL ADHESIVE PRODUCTION

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

Table 23 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	175,000	0.854701	149,573	225,733	74,726	300,459	256,803
2	200,000	0.730514	146,103	1,208	83,161	84,369	61,633
3	225,000	0.624371	140,483	1,208	91,597	92,805	57,945
4	250,000	0.53365	133,413	1,209	100,034	101,243	54,028
5	250,000	0.456111	114,028		100,034	100,034	45,627
6	250,000	0.389839	97,460		100,034	100,034	38,997
7	250,000	0.333195	83,299		100,034	100,034	33,331
8	250,000	0.284782	71,196		100,034	100,034	28,488
9	250,000	0.243404	60,851		100,034	100,034	24,349
10	250,000	0.208037	52,009		100,034	100,034	20,811
Total			1,048,413				622,010

A. Benefit- cost ratio At 17% D.F. = 1.68

B. NPV At 17% D.F. = 426,403,000 Birr