

**91. PROFILE ON THE PRODUCTION OF
RETREADED TYRES**

TABLE OF CONTENTS

		<u>PAGE</u>
I.	SUMMARY	91-2
II.	PRODUCT DESCRIPTION & APPLICATION	91-3
III.	MARKET STUDY AND PLANT CAPACITY	91-3
	A. MARKET STUDY	91-3
	B. PLANT CAPACITY & PRODUCTION PROGRAM	91-6
IV.	MATERIALS AND INPUTS	91-6
	A. RAW & AUXILIARY MATERIALS	91-6
	B. UTILITIES	91-7
V.	TECHNOLOGY & ENGINEERING	91-7
	A. TECHNOLOGY	91-7
	B. ENGINEERING	91-10
VI.	HUMAN RESOURCE & TRAINING REQUIREMENT	91-15
	A. HUMAN RESOURCE REQUIREMENT	91-15
	B. TRAINING REQUIREMENT	91-16
VII.	FINANCIAL ANALYSIS	91-16
	A. TOTAL INITIAL INVESTMENT COST	91-17
	B. PRODUCTION COST	91-18
	C. FINANCIAL EVALUATION	91-19
	D. ECONOMIC AND SOCIAL BENEFITS	91-20

I. SUMMARY

This profile envisages the establishment of a plant for the production of retreaded tyre with a capacity of of 235, 000 units (average equivalent weight of 8,500 tons) per annum. A retreaded tyre is a previously worn tyre which has gone through a remanufacturing process designed to extend its useful service life. Retreaded tyres are widely used in large-scale operations such as trucks, buses and commercial aviation.

The demand for retreaded tyre is met through local production and import. The present (2012) demand for retreaded tyre is estimated 359,995 pieces. The demand for retreaded tyre is projected to reach 528,950 pieces and 777,201 pieces by the year 2017 and 2022, respectively.

The principal raw materials required are used tyre casing, camelback/thread, cement and solvents. Tyre casing is available locally while the solvent and thread have to be imported.

The total investment cost of the project including working capital is estimated at Birr 70.32 million. From the total investment cost, the highest share (Birr 35.37 million or 50.30%) is accounted by fixed investment cost followed by initial working capital (Birr 29.06 million or 41.33%) and pre operation cost (Birr 5.88 million or 8.37%). From the total investment cost Birr 24 million or 34.12% is required in foreign currency.

The project is financially viable with an internal rate of return (IRR) of 23.04% and a net present value (NPV) of Birr 50.58 million, discounted at 10%.

The project can create employment for 10 persons. The establishment of such factory will have a foreign exchange saving effect to the country by substituting the current imports. The project will also create backward linkage with recycled waste (green/sustainable) material sub sector and forward linkage with the freight transport, passenger transport, and commercial aviation sub sectors and also generates income for the Government in terms of tax revenue and payroll tax.

II. PRODUCT DESCRIPTION AND APPLICATION

A **retread**, also sometimes known as a "recap or a "remold" is a previously worn tyre which has gone through a remanufacturing process designed to extend its useful service life. Retreading starts with a safety inspection of the tyre. The old thread is then buffed away, and a new rubber thread is applied to the bare "casing" using specialized machinery.

Retreads are significantly cheaper than new tyres. As a result, they are widely used in large-scale operations such as trucks, buses and commercial aviation. They are also the most environmentally friendly way of recycling used tyres - in some applications; a tyre can be retreaded up to 10 times. Retreading of tyre is a recycling job. While it takes 26.5 liters of crude oil to manufacture one new passenger tyre, a retread requires only 9.5 liters. The savings in truck-tyre retreading are even greater.

III. MARKET STUDY AND PLANT CAPACITY

A. MARKET STUDY

1. Past Supply and Present Demand

The local demand for retreaded tyres is met through local production and import. However, there is no available data that indicates the amount of retreaded tyre locally produced and imported. Hence, an indirect approach (based on local production and import of new tyres) is employed to estimate the demand for the product. Accordingly, Table 3.1 shows local production and import of new tyres.

Table 3.1**TOTAL SUPPLY OF TYRE FOR VEHICLES (PCS)**

Year	Local		Total
	Production	Import	
2002	197,540	532,725	730,265
2003	191,309	835,382	1,026,691
2004	181,725	738,318	920,043
2005	210,374	786,850	997,224
2006	211,725	741,742	953,467
2007	285,134	901,383	1,186,517
2008	316,337	967,385	1,283,722
2009	390,374	1,140,508	1,530,882
2010	322,939	929,682	1,252,621
2011	446,257	1,177,681	1,623,938

Source: 1. CSA, Report of the Survey of the Manufacturing and Electricity Industries.

2. Ethiopian Revenues and Customs Authority.

As can be seen from Table 3.1 total supply or apparent consumption of new tyres during the period 2002 – 2011 fluctuates from year to year ranging from the lowest 730,265 pieces in 2002 to the highest 1.62 million pieces in 2011. However a general growth can be observed. For example the average annual total supply during the first five years (2002-2006) which was 925,538 pieces has increased to an average of 1,375,536 during the next five years (2007-2011). Moreover, during the period under consideration (2002--2011) total supply of tyres for vehicle has registered an average annual growth rate of 10.84%.

Therefore, assuming that the growth rate registered by the total supply of the product in the past will continue at least in the near future, the present (2012) demand for new vehicle tyres is estimated at 1,799,973 pieces by taking the 2011 level of total supply as a base and applying a growth rate of 10.84%. It is also assumed that locally produced retreaded tyres can substitute 20% of the demand for new tyres. Accordingly, the present demand for retreaded tyres is estimated at 359,995 pieces.

2. Demand Projection

The future demand for vehicle tyres depends on the growth of the fleet size of vehicles in the country. The total number of inspected and registered vehicles in the country in 2000 was only 96,504. This number has grown to 199,414 in 2010. During the period 2000 – 2010 the number of operational vehicles has registered an average annual growth rate of 8.04%, accordingly, the future demand for retreaded tyres is assumed to annually increase at the rate of 8%. (See Table 3.2)

Table 3.2

FORECASTED DEMAND FOR RETREADED TIRE (PIECES)

Year	Projected Demand
2013	388,794
2014	419,898
2015	453,489
2016	489,769
2017	528,950
2018	571,266
2019	616,967
2020	666,325
2021	719,631
2022	777,201
2023	839,377
2024	906,528
2025	979,050

3. Pricing and Distribution

The price of tyres varies according to size, type and origin. For the purpose of financial analyses, an average a factory -get price of Birr 600 is adopted based on the current market price for the products.

The tyre retreading service will be provided based on the orders to be given by individuals or enterprises that require the service

B. PLANT CAPACITY AND PRODUCTION PROGRAM

1. Plant Capacity

The plant capacity of tyre recapping is mainly determined with the capacity of the vulcanizing presses/or ovens. For the purpose of this study, considering the fierce competition from imported ones and some local producers and the required investment a plant capacity of 235,000 pieces (average equivalent weight of 8,500 tons is envisaged). From this total tonnage, about 45% of it the genuine camel back is considered; as the casing is from the old tyre. This would mean a yearly thread application of 3,825 tons, daily production capacity of 12.75 tons, working in 3 shifts a day for 300 days a year.

Owing to a relatively high energy requirement of the production process, it is preferable to operate the plant continuously. Besides, energy saving and recovery methods are devised and implemented. In addition, good maintenance practice, and careful monitoring of the operation are required to minimize operating costs as much as possible.

2. Production Program

The plant is initially made to operate at 75% of the installed capacity. It then gradually builds its capacity up to 85% and 100% of the installed capacity in the second and third years, respectively.

As the plant will be new and to be equipped with new machinery, production build up is made to start at reduced capacity and gradually raise to full capacity. This low production level at the initial stage is to develop substantial market outlets for the product. Machinery operators will also get enough time to develop the required skills and experience.

IV. MATERIAL AND INPUTS

A. RAW AND AUXILIARY MATERIALS

The major raw materials for tyre recapping are used tyre casing, camelback/tread, cement and solvents. The required tyre casing can be obtained from local sources. Table 4.1 shows annual requirement of auxiliary materials and related costs at full capacity operation.

Table 4.1

RAW AND AUXILIARY MATERIALS REQUIREMENT AND COST

Sr.No.	Item	Qty. (tons)	Cost ('000 Birr)		
			F.C	L.C	Total
1	Used Tire casing	4,675	-	9,400	9,400
2	Cushion gum and solvent	70	9		9
3	Pre-cured tread rubber	3,825	114,750		114,750
	Grand Total		114,759	9,400	124,159

B. UTILITIES

Utilities required by the envisaged plant are water, electricity and steam. An oil- fired boiler will be used to generate steam required by the plant. Table 4.2 shows the annual requirements of utilities together with related costs.

Table 4.2

UTILITIES REQUIREMENT AND COST

Sr. No	Description	Unit of Measure	Qty	Unit Cost (Birr)	Cost (Birr)
1	Electricity	kWh	181,00	0.58	104,980
2	Water	M ³	2,000	10.00	20,000
3	Fuel oil	Litre	28,950	14.80	428,460
	Total				553,440

V. TECHNOLOGY AND ENGINEERING

A. TECHNOLOGY

1. Production Process

The process of retreading tyres can be divided into the following 5 consecutive steps:

➤ Initial inspection

Before retreading, every used tyre casing must pass inspection. The casing is carefully examined by an inspector on a specific automatic inspection machine. It must be kept in mind that inspection is always a matter of trained judgment. The most sophisticated equipment cannot replace the inspector's decision. Therefore the human element always plays an important part in the process of retreading. The primary reason is to ensure the tyre casing will be able to be retreaded and it is safe to return to operation.

Tire manufacturers design tyre to provide service greater than the thread will last, but due to operating conditions or damaged to the tyre casing, a tyre may not be safe to return to service.

➤ Buffing and touching up the used tire

The buffing process establishes the foundation upon which the new thread is built. At buffing, parts of the remaining original thread rubber are removed from the used tyre. The object of this operation is to prepare a clean velvet surface with the correct texture for maximum adhesion of the new thread rubber and establish the contour/ radius of the thread area. The casing must have a specific shape in order to perform as designed after the retreading process. Since this is a critical step, the newly developed buffing machines are synchronized with a computer with the specific dimensions needed and allow it to control this buffing process.

➤ Casing Preparation / Skiving / Buzz Out

This is the next step in inspecting the tyre. Any injuries to the casing are further examined and evaluated for repair. If these injured areas fall within specific repairing limitations, the damaged area is prepared for a repair.

➤ **Repairing**

Once an injured area has been evaluated, cleaned, and prepared, a repair can be applied. A repair is intended to extend the life of the tyre and provide a safe quality product for your operation. Any other voids are filled with rubber to ensure a flat surface with no voids for the thread rubber to be applied.

➤ **Application of new rubber/Building**

After the casing has been prepared and repaired, the casing is ready for the thread rubber. There are three different types of thread applications: pre-cured rubber thread, Unicycle® pre-cured rubber thread, and mold rubber. The pre-cured rubber process uses a thread that is already molded and pre-cured into the thread pattern. The thread is wrapped around the casing with an adhesive (cushion gum bonding layer) applied between the casing and the thread. The two ends of the thread are spliced and stitched together.

The UniCircle® pre-cured thread is a seamless construction using a patented retreading process, adhering the tread snugly to the casing. A laser positioning system ensures the thread is fit to the casing precisely.

The mold rubber process is applied in the same fashion as a new tyre construction. This rubber is un-cured or “green” rubber. The green rubber is wrapped around the casing in one continuous ribbon as it leaves the extruder. The tyre is built up with layers until it has reached the specifications needed for the thread.

After the application of a rubber solution by means of a spray-gun, uncured cushion gum with the final profile is applied to the casing. After this application, the tyre is mounted on a rim.

➤ **Vulcanization of the new tread**

The envisaged plant may use different curing methods depending on the tyre and the thread pattern needed. Tyres with pre-cured thread rubber are placed into an autoclave and vulcanized using time, temperature and pressure to bond the thread to the casing.

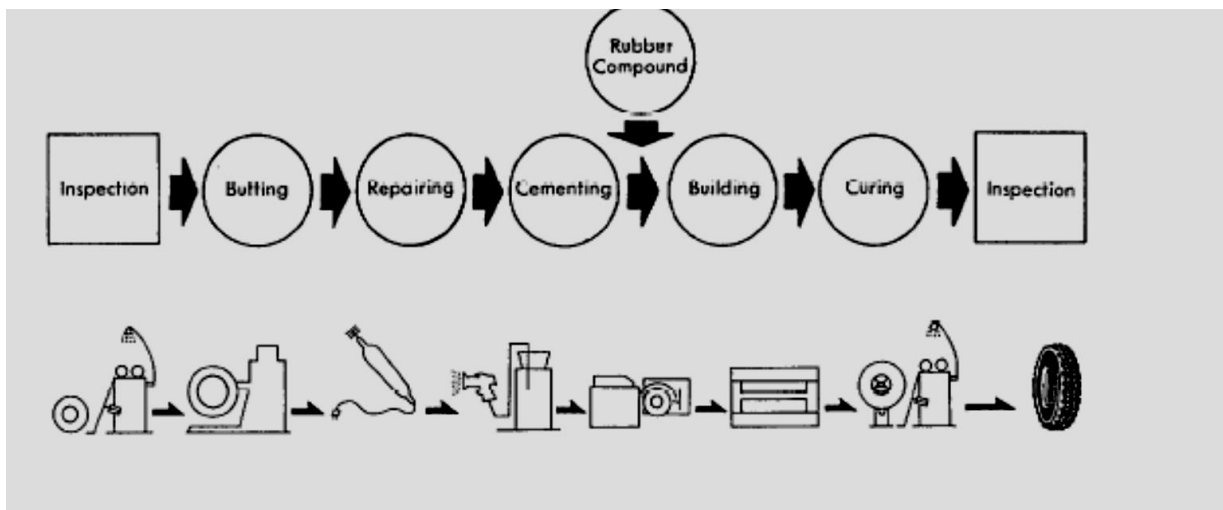
Tyres with green rubber thread are placed into a mold which exerts the pressure and heat to force the un-cured rubber into the mold's thread pattern and cure the green rubber. The green rubber is changed from its original state (soft, tacky, stretchy) into a tough and hard rubber state. This mold cure process creates a denser thread and greater bond resulting in better performance than any other method. For vulcanization made in autoclaves are usually designed to process up to 22 tyres. The uncured cushion gum which acts as a bridge between tyre casing and pre-cured tread, is vulcanized at a temperature of 95 to max. 110⁰C. This process takes approx. 4% to 5 hours. After the curing time all tyres in the autoclave are finished simultaneously.

➤ **Final inspection**

At the last step of production the finished tyres are carefully tested by the inspector on an automatic inspection machine.

PROCESS FLOW DIAGRAM

The process of retreading of a tire can be described in diagrammatically in the following way:



2. Environmental Impact Assessment

Since the process uses no harmful solvents that have a tendency to leak from the system and react with any water in the process, the environmental effect of the process is safe and does not need any treatment considerations.

B. ENGINEERING

1. Plant Machinery and Equipment

Total cost of machinery and equipment is Birr 31.2 million of which Birr 24 million is required in foreign currency. The type of machineries and equipment required are indicated in Table 5.1.

Table 5.1

LIST OF MACHINERY & EQUIPMENT

Sr. No.	Description	Quantity
1	Tire inspection machine	1
2	Buffing machine	3
3	Tire builder	2
4	Hoists	4
5	Monorail	2
6	Conveyors	2
7	Tire repair spreaders	3
8	Tire buzz-out repair stations	3
9	Airless spraying tuners	3
10	Buzz-out repair filling stations	3
11	Enveloping machine	4
12	Rim fitting machines	4
13	Curing chamber	3
14	Autoclaves	3

2. Land, Building and Civil Works

Land area is required for factory building, administration building, space for social facilities, for internal roads and pathways, and space for future expansion. The total land area required is estimated to be 800 m². Of the total land area, 600 m² will be built-up area. At the rate of Birr 5,000 per m², the total cost of building and civil work is estimated at Birr 3 million.

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

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

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

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

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

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

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

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

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

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

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

Zone	Level	Floor Price/m²
Central Market District	1 st	1686
	2 nd	1535
	3 rd	1323
	4 th	1085
	5 th	894
Transitional zone	1 st	1035
	2 nd	935
	3 rd	809
	4 th	685
	5 th	555
Expansion zone	1 st	355
	2 nd	299
	3 rd	217
	4 th	191

Accordingly, in order to estimate the land lease cost of the project profiles it is assumed that all new manufacturing projects will be located in industrial zones located in expansion zones. Therefore, for the profile a land lease rate of Birr 266 per m² which is equivalent to the average floor price of plots located in expansion zone is adopted.

On the other hand, some of the investment incentives arranged by the Addis Ababa City Administration on lease payment for industrial projects are granting longer grace period and extending the lease payment period. The criteria are creation of job opportunity, foreign exchange saving, investment capital and land utilization tendency etc. Accordingly, Table 5.3 shows incentives for lease payment.

Table 5.3**INCENTIVES FOR LEASE PAYMENT OF INDUSTRIAL PROJECTS**

Scored Point	Grace Period	Payment Completion Period	Down Payment
Above 75%	5 Years	30 Years	10%
From 50 - 75%	5 Years	28 Years	10%
From 25 - 49%	4 Years	25 Years	10%

For the purpose of this project profile, the average i.e. five years grace period, 28 years payment completion period and 10% down payment is used. The land lease period for industry is 60 years.

Accordingly, the total land lease cost at a rate of Birr 266 per m² is estimated at Birr 212,800 of which 10% or Birr 21,280 will be paid in advance. The remaining Birr 191,520 will be paid in equal installments with in 28 years i.e. Birr 6,840 annually.

VI. HUMAN RESOURCE & TRAINING REQUIREMENT

A. HUMAN RESOURCE REQUIREMENT

A total of 10 persons are required for both administrative and production activities. The annual cost of labor is Birr 183,600. The mix of employees of the plant with related monthly salaries and annual wages is shown in Table 6.1.

Table 6.1**HUMAN RESOURCE REQUIREMENT AND LABOR COST (BIRR)**

Sr. No.	Job Title	No.	Monthly Salary	Annual Wages
1	Administration	2	5,000	60,000
2	Mechanic	1	2,200	26,400
3	Skilled worker	2	3,600	43,200
4	Unskilled worker	5	4,500	54,000
	Total	10		183,600

B. TRAINING REQUIREMENT

Training is required for production workers particularly for quality skilled laborer. The training program will be executed at the plant site during erection and commissioning. The machinery supplier will be responsible to conduct the training program. A total of Birr 20,000 will be allocated for the training program.

VII. FINANCIAL ANALYSIS

The financial analysis of the retreaded tyres project is based on the data presented in the previous chapters and the following assumptions:-

Construction period	1 year
Source of finance	30 % equity & 70% loan
Tax holidays	3 years
Bank interest	10%
Discount cash flow	10%
Accounts receivable	30 days
Raw material local	30 days
Raw material imported	120 days
Work in progress	1 day

Finished products	30 days
Cash in hand	5 days
Accounts payable	30 days
Repair and maintenance	5% of machinery cost

A. TOTAL INITIAL INVESTMENT COST

The total investment cost of the project including working capital is estimated at Birr 70.32 million (see Table 7.1). From the total investment cost, the highest share (Birr 35.37 million or 50.30%) is accounted by fixed investment cost followed by initial working capital (Birr 29.06 million or 41.33%) and pre operation cost (Birr 5.88 million or 8.37%). From the total investment cost Birr 24 million or 34.12% is required in foreign currency.

Table 7.1

INITIAL INVESTMENT COST ('000 Birr)

Sr. No.	Cost Items	Local Cost	Foreign Cost	Total Cost	% Share
1	Fixed investment				
1.1	Land Lease	21.28		21.28	0.03
1.2	Building and civil work	3,000.00		3,000.00	4.27
1.3	Machinery and equipment	7,200.00	24,000.00	31,200.00	44.37
1.4	Vehicles	900.00		900.00	1.28
1.5	Office furniture and equipment	250.00		250.00	0.36
	Sub -total	11,371.28	24,000.00	35,371.28	50.30
2	Pre operating cost *				
2.1	Pre operating cost	1,286.00		1,286.00	1.83
2.2	Interest during construction	4,600.60		4,600.60	6.54
	Sub-total	5,886.60		5,886.60	8.37
3	Working capital	29,065.56		29,065.56	41.33
	Grand Total	46,323.43	24,000.00	70,323.43	100

* N.B Pre operating cost include project implementation cost such as installation, startup, commissioning, project engineering, project management etc and capitalized interest during construction.

** The total working capital required at full capacity operation is Birr 41.51 million. However, only the initial working capital of Birr 29.06 million during the first year of production is assumed to be funded through external sources. During the remaining years the working capital requirement will be financed by funds to be generated internally (for detail working capital requirement see Appendix 7.A.1).

B. PRODUCTION COST

The annual production cost at full operation capacity is estimated at Birr 138.30 million (see Table 7.2). The cost of raw material account for 89.77% of the production cost. The other major components of the production cost are depreciation, financial cost and repair and maintenance which account for 4.93%, 3.20% and 1.13%, respectively. The remaining 0.96% is the share of cost of utility, marketing and distribution, labor direct, labor overhead and administration cost. For detail production cost see Appendix 7.A.2.

Table 7.2

ANNUAL PRODUCTION COST AT FULL CAPACITY (YEAR THREE)

Items	Cost (000 Birr)	%
Raw Material and Inputs	124,159.00	89.77
Utilities	553.00	0.40
Maintenance and repair	1,560.00	1.13
Labor direct	184.00	0.13
Labor overheads	46.00	0.03
Administration Costs	200.00	0.14
Land lease cost	-	-
Cost of marketing and distribution	350.00	0.25
Total Operating Costs	127,052.00	91.87
Depreciation	6,822.20	4.93
Cost of Finance	4,428.08	3.20
Total Production Cost	138,302.28	100

C. FINANCIAL EVALUATION

1. Profitability

Based on the projected profit and loss statement, the project will generate a profit through out its operation life. Annual net profit after tax will grow from Birr 6.94 million to Birr 13.77 million during the life of the project. Moreover, at the end of the project life the accumulated net cash

flow amounts to Birr 131.57 million. For profit and loss statement and cash flow projection see Appendix 7.A.3 and 7.A.4, respectively.

2. Ratios

In financial analysis, financial ratios and efficiency ratios are used as an index or yardstick for evaluating the financial position of a firm. It is also an indicator for the strength and weakness of the firm or a project. Using the year-end balance sheet figures and other relevant data, the most important ratios such as return on sales which is computed by dividing net income by revenue, return on assets (operating income divided by assets), return on equity (net profit divided by equity) and return on total investment (net profit plus interest divided by total investment) has been carried out over the period of the project life and all the results are found to be satisfactory.

3. Break-even Analysis

The break-even analysis establishes a relationship between operation costs and revenues. It indicates the level at which costs and revenue are in equilibrium. To this end, the break-even point for capacity utilization and sales value estimated by using income statement projection are computed as followed.

$$\text{Break -Even Sales Value} = \frac{\text{Fixed Cost} + \text{Financial Cost}}{\text{Variable Margin ratio (\%)}} = \text{Birr } 52,219,148$$

$$\text{Break -Even Capacity utilization} = \frac{\text{Break -even Sales Value}}{\text{Sales revenue}} \times 100 = 36 \%$$

4. Pay-back Period

The pay- back period, also called pay – off period is defined as the period required for recovering the original investment outlay through the accumulated net cash flows earned by the project. Accordingly, based on the projected cash flow it is estimated that the project’s initial investment will be fully recovered within 5 years.

5. Internal Rate of Return

The internal rate of return (IRR) is the annualized effective compounded return rate that can be earned on the invested capital, i.e., the yield on the investment. Put another way, the internal rate of return for an investment is the discount rate that makes the net present value of the investment's income stream total to zero. It is an indicator of the efficiency or quality of an investment. A project is a good investment proposition if its IRR is greater than the rate of return that could be earned by alternate investments or putting the money in a bank account. Accordingly, the IRR of this project is computed to be 23.04%% indicating the viability of the project.

6. Net Present Value

Net present value (NPV) is defined as the total present (discounted) value of a time series of cash flows. NPV aggregates cash flows that occur during different periods of time during the life of a project in to a common measuring unit i.e. present value. It is a standard method for using the time value of money to appraise long-term projects. NPV is an indicator of how much value an investment or project adds to the capital invested. In principle, a project is accepted if the NPV is non-negative. Accordingly, the net present value of the project at 10% discount rate is found to be Birr 50.58 million which is acceptable. For detail discounted cash flow see Appendix 7.A.5.

D. ECONOMIC AND SOCIAL BENEFITS

The project can create employment for 10 persons. The project will generate Birr 33.32 million in terms of tax revenue. The establishment of such factory will have a foreign exchange saving effect to the country by substituting the current imports. The project will also create backward linkage with recycled waste (green/sustainable) sub sector and forward linkage with the freight transport, passenger transport, and commercial aviation sub sectors and also generates other income for the Government.

Appendix 7.A

FINANCIAL ANALYSES SUPPORTING TABLES

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

Item	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11
Raw Material and Inputs	86,911	99,327	124,159	124,159	124,159	124,159	124,159	124,159	124,159	124,159
Utilities	387	442	553	553	553	553	553	553	553	553
Maintenance and repair	1,092	1,248	1,560	1,560	1,560	1,560	1,560	1,560	1,560	1,560
Labour direct	129	147	184	184	184	184	184	184	184	184
Labour overheads	32	37	46	46	46	46	46	46	46	46
Administration Costs	140	160	200	200	200	200	200	200	200	200
Land lease cost	0	0	0	0	7	7	7	7	7	7
Cost of marketing and distribution	350	350	350	350	350	350	350	350	350	350
Total Operating Costs	89,041	101,712	127,052	127,052	127,059	127,059	127,059	127,059	127,059	127,059
Depreciation	6,822	6,822	6,822	6,822	6,822	145	145	145	145	145
Cost of Finance	0	5,061	4,428	3,795	3,163	2,530	1,898	1,265	633	0
Total Production Cost	95,864	113,594	138,302	137,670	137,044	129,734	129,102	128,469	127,836	127,204

Appendix 7.A.3
INCOME STATEMENT (in 000 Birr)

Item	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11
Sales revenue	102,813	132,188	146,875	146,875	146,875	146,875	146,875	146,875	146,875	146,875
Less variable costs	88,691	101,362	126,702	126,702	126,702	126,702	126,702	126,702	126,702	126,702
VARIABLE MARGIN	14,122	30,826	20,173	20,173	20,173	20,173	20,173	20,173	20,173	20,173
in % of sales revenue	13.74	23.32	13.73	13.73	13.73	13.73	13.73	13.73	13.73	13.73
Less fixed costs	7,172	7,172	7,172	7,172	7,179	502	502	502	502	502
OPERATIONAL MARGIN	6,949	23,654	13,001	13,001	12,994	19,671	19,671	19,671	19,671	19,671
in % of sales revenue	6.76	17.89	8.85	8.85	8.85	13.39	13.39	13.39	13.39	13.39
Financial costs		5,061	4,428	3,795	3,163	2,530	1,898	1,265	633	0
GROSS PROFIT	6,949	18,594	8,573	9,205	9,831	17,141	17,773	18,406	19,039	19,671
in % of sales revenue	6.76	14.07	5.84	6.27	6.69	11.67	12.10	12.53	12.96	13.39
Income (corporate) tax	0	0	0	2,762	2,949	5,142	5,332	5,522	5,712	5,901
NET PROFIT	6,949	18,594	8,573	6,444	6,882	11,999	12,441	12,884	13,327	13,770
in % of sales revenue	6.76	14.07	5.84	4.39	4.69	8.17	8.47	8.77	9.07	9.38

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

Item	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Scrap
TOTAL CASH INFLOW	36,657	136,581	132,203	146,904	146,875	146,875	146,875	146,875	146,875	146,875	146,875	47,932
Inflow funds	36,657	33,768	15	29	0	0	0	0	0	0	0	0
Inflow operation	0	102,813	132,188	146,875	146,875	146,875	146,875	146,875	146,875	146,875	146,875	0
Other income	0	0	0	0	0	0	0	0	0	0	0	47,932
TOTAL CASH OUTFLOW	36,657	122,809	117,261	146,131	139,935	139,498	141,057	140,614	140,172	139,729	132,960	0
Increase in fixed assets	36,657	0	0	0	0	0	0	0	0	0	0	0
Increase in current assets	0	29,167	4,163	8,325	0	1	0	0	0	0	0	0
Operating costs	0	88,691	101,362	126,702	126,702	126,709	126,709	126,709	126,709	126,709	126,709	0
Marketing and Distribution cost	0	350	350	350	350	350	350	350	350	350	350	0
Income tax	0	0	0	0	2,762	2,949	5,142	5,332	5,522	5,712	5,901	0
Financial costs	0	4,601	5,061	4,428	3,795	3,163	2,530	1,898	1,265	633	0	0
Loan repayment	0	0	6,326	6,326	6,326	6,326	6,326	6,326	6,326	6,326	0	0
SURPLUS (DEFICIT)	0	13,772	14,942	773	6,940	7,377	5,818	6,261	6,703	7,146	13,915	47,932
CUMULATIVE CASH BALANCE	0	13,772	28,713	29,486	36,427	43,804	49,622	55,882	62,586	69,732	83,647	131,579

Appendix 7.A.5**DISCOUNTED CASH FLOW (in 000 Birr)**

Item	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Scrap
TOTAL CASH INFLOW	0	102,813	132,188	146,875	146,875	146,875	146,875	146,875	146,875	146,875	146,875	47,932
Inflow operation	0	102,813	132,188	146,875	146,875	146,875	146,875	146,875	146,875	146,875	146,875	0
Other income	0	0	0	0	0	0	0	0	0	0	0	47,932
TOTAL CASH OUTFLOW	65,723	93,189	110,008	127,052	129,814	130,008	132,201	132,391	132,581	132,770	132,960	0
Increase in fixed assets	36,657	0	0	0	0	0	0	0	0	0	0	0
Increase in net working capital	29,066	4,148	8,296	0	1	0	0	0	0	0	0	0
Operating costs	0	88,691	101,362	126,702	126,702	126,709	126,709	126,709	126,709	126,709	126,709	0
Marketing and Distribution cost	0	350	350	350	350	350	350	350	350	350	350	0
Income (corporate) tax		0	0	0	2,762	2,949	5,142	5,332	5,522	5,712	5,901	0
NET CASH FLOW	-65,723	9,624	22,180	19,823	17,061	16,867	14,674	14,484	14,294	14,105	13,915	47,932
CUMULATIVE NET CASH FLOW	-65,723	-56,099	-33,919	-14,096	2,965	19,832	34,505	48,990	63,284	77,389	91,303	139,236
Net present value	-65,723	8,749	18,331	14,893	11,653	10,473	8,283	7,433	6,668	5,982	5,365	18,480
Cumulative net present value	-65,723	-56,974	-38,643	-23,750	-12,097	-1,624	6,659	14,091	20,760	26,741	32,106	50,586

NET PRESENT VALUE 50,586
INTERNAL RATE OF RETURN 23.04%
NORMAL PAYBACK 5 years