

**85. PROFILE ON THE PRODUCTION OF
RECLAIMED RUBBER**

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I. SUMMARY

This profile envisages the establishment of a plant for the production of reclaimed rubber with a capacity of 3,000 tons per annum. The end products of reclaimed rubber are tyres, tyre repair materials, inner tubes, hard rubber battery boxes, soles and rubber foot wear, hose belting, packing and rubber surfacing material.

The demand for reclaimed rubber is met through domestic production and import. The present (2012) demand for reclaimed rubber is estimated at 2,730 tons. The demand for reclaimed rubber is projected to reach 4,397 tons and 7,082 tons by the year 2017 and 2022, respectively.

The principal raw materials required are scrap rubber, reclaiming agent and talc. Scrap rubber is available locally while reclaiming agent and talc have to be imported.

The total investment cost of the project including working capital is estimated at Birr 46.56 million. From the total investment cost, the highest share (Birr 33.73 million or 72.45%) is accounted by fixed investment cost initial followed by working capital (8.68 million or 18.65%) and pre operation cost (Birr 4.15 million or 8.90%). From the total investment cost, Birr 18.75 million or 40.27% is required in foreign currency.

The project is financially viable with an internal rate of return (IRR) of 23.36% and a net present value (NPV) of Birr 32.64 million, discounted at 10%.

The project can create employment for 101 persons. The project will generate Birr 21.49 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) sub sector and forward linkage with the reclaimed rubber users and also generates other income for the Government.

II. PRODUCT DESCRIPTION AND APPLCIATION

Reclaimed rubber is a product made by treating vulcanized scrap rubber tyre, tubes and miscellaneous waste rubber articles by application of heat and chemical agents. The end products of reclaimed rubber are , tire repair materials, inner tubes, hard rubber battery boxes, soles and rubber foot wear, hose belting, packing and rubber surfacing material.

Reclaimed rubber has found wider application due to a number of advantages. It is cheaper and stable in price, speeds up mixing operations, wets the pigments and blends the mixture together with ease. Because of it plasticity, it can easily be worked with solvents to form useful, high solid cements.

III MARKET STUDY AND PLANT CAPACITY

A. MARKET STUDY

1 Past Supply and Present Demand

In Ethiopia National Nucleus Project (NNP) for Rubber Plantation and Processing and Bebeke Coffee Plantation Enterprise are the only local natural rubber producers in the country. These organizations produce natural rubber latex which undergoes some processing and their final output is Ribbed Smoked Sheet (RSS). However, the annual production capacity of the local producers is very limited. For example during the period 2003--2008 the average local production of natural rubber was only 14.5 tons. Hence, import is the major source supply for the product. Table 3.1 shows the annual import of natural rubber for the period 2002 - 2011.

Table 3.1
IMPORT OF NATURAL RUBBER (TONS)

Year	Quantity
2002	1,247
2003	3,443
2004	2,318
2005	2,648
2006	1,923
2007	2,272
2008	2,077
2009	2,240
2010	2,231
2011	2,334

Source: - Ethiopian Revenues & Customs Authority.

As can be seen from Table 3.1, the total import of natural rubber fluctuates from year to year. However, import has registered an annual average growth rate of 17% during the period under consideration (2002-2011). Accordingly, in order to estimate the present demand it is assumed that the average growth rate registered in the past will continue at least in the near future. Hence, by taking the year 2011 level of supply as a base and applying a growth rate of 17%, the present (2012) demand for natural rubber is estimated at 2,730 tons.

2. Demand Projection

The target market for rubber include factories engaged in tire, canvas and rubber shoes, various types of soles, industrial machines and automotive rubber spare parts production and tire retreading. According to the Growth and Transformation Plan (GTP), the industrial sector is expected to grow at an average annual growth rate of 20% during the period 2011 – 2015. Taking this in to account and to be conservative an annual average growth rate of 10% is assumed for projecting the demand for rubber (see Table 3.2.).

Table 3.2
PROJECTED DEMAND FOR RECLAIMED RUBBER (TONS)

Year	Projected Demand
2013	3,003
2014	3,304
2015	3,634
2016	3,997
2017	4,397
2018	4,837
2019	5,321
2020	5,853
2021	6,438
2022	7,082
2023	7,790
2024	8,569
2025	9,426

3. Pricing and Distribution

After assessing the current C.I.F price of reclaimed rubber, an ex-factory price of Birr 19.07/kg is proposed for the envisaged project. The product can be distributed directly to end users.

B. PLANT CAPACITY AND PRODUCTION PROGRAM

1. Plant Capacity

The market study shows that demand for rubber increases from 3,003 tons in the year 2013 to 7,790 tons in the year 2023. Based on the market study, period required for implementing the project and market penetration and technical skill development, and minimum economics of scale, the envisaged plant capacity is 3,000 tons per annum operating in three shifts per day and 300 working days per year.

2. Production Program

In order to develop the operators' skill in production and quality control, it is vital to have a gradual capacity buildup. In addition to this, a period is required to penetrate to the market. Hence, it is assumed that the plant will go into full capacity operation in four years' time starting with 70% capacity in the first year and progressively developing to 85%, 95% and 100% in the second, third and fourth year and then after respectively. The production program of the envisaged plant is given in Table 3.3.

Table 3.3

PRODUCTION PROGRAM OF THE ENVISAGED RECLAIMED RUBBER PLANT

Sr. No.	Item Description	1st year	2nd year	3rd year	4th -10th
1	Production of reclaimed rubber (tons)	2,100	2,550	2,850	3,000
2	Capacity utilization (%)	70	85	95	100

IV. MATERIALS AND INPTUS

A. MATERIALS

The primary ingredients used to prepare reclaimed rubber are scrape rubber, reclaiming agent and talc. The total annual cost of raw material at full capacity operation is estimated at Birr 36,090,000. The annual requirement of raw material and their estimated costs at full capacity operation are presented in Table 4.1.

Table 4.1**REQUIREMENT OF RAW & AUXILIARY MATEIRALS AND COST**

Sr. No.	Item Description	Quantity	Cost ('000 Birr)		
			LC	FC	TC
1	Scrape rubber	4,000	24,000	-	24,000
2	Reclaiming agent(oil)	300	-	12,000	12,000
3	Talc	30	-	90	90
			24,000	12,090	36,090

B. UTILITIES

Utilities required are electricity, fuel oil and water. Electricity is used for running machineries and lighting. Water is used for:

- Steam generation for devulcanization (Boiler) process;
- Cooling water for the machines (Cracker, Grinder and Refining Mills);
- Floor and Machinery washing;
- Contact cooling of rubber sheets;
- Make up water for preparation of antitank solution; and
- Domestic Purposes.

Fuel oil is used for generation of steam to be used at the depolymerisation process stage.

The total annual cost of utilities is estimated at Birr 2,767,348. The annual quantities and cost of utilities are estimated as shown in Table 4.2.

Table 4.2**ANNUAL UTILITIES REQUIREMENT AND COST**

Sr. No.	Description	Qty	Cost (' 000 Birr)		
			F.C	L.C	Total
1	Electric Power(kWh)	750,600	-	435.35	435.35
2	Water(m ³)	10,000	-	100.00	100.00
3	Fuel oil	150,000	-	2,232.00	2,232.00
	Total			2,767.35	2,767.35

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

Three basic techniques are used to produce reclaimed rubber as discussed below.

➤ Wet Digester Process

The digester process consists of placing the ground scrap, water and reclaimed agents into a steam-jacketed agitator-equipped autoclave (digester). The batch is then cooked for 5-24 hours at 370-405° F. Reclaiming agents are used including petroleum and coal tar-based oils and resins as well as various chemical softeners such as phenol alkyl sulfides and disulfides, thiols (mercaptans) and amino-compounds. The reclaiming agents generally function by catalyzing the oxidative breakdown of the polymer chain and oxidative disruption of sulfur crosslink. Sometimes, de-fibering agents such as caustic soda or chlorides of zinc and calcium and plasticizing oils are added to the digester to complete the charge. At the end of the digestion period, the contents of the digester are screened, frequently washed, dewatered and dried in a hot-oven prior to further processing. Chemical de-fibering and the subsequent washing process create an effluent problem. Hence, this process is not opted by reclaim industries these days.

➤ Pan (Heater) Process

The finely ground scrap which is usually free from fiber is blended with the correct amount of reclaiming agents and placed in a single shell pressure vessel (autoclave) into which live steam is

passed. Depolymerisation is carried out at about 365° F for 2-18 hours. After this treatment, the heater is vented, the pressure vessel discharged and the crumb of rubber sent on further processing. Since the condensate from this operation is highly contaminated with oils, resins etc, it cannot be returned to the boilers and therefore, must be treated as a waste. This process is relatively inexpensive because the equipment is simple and the washing and drying steps are eliminated. This process is mainly used in the world with some variation, known as dry digester process.

➤ **Mechanical Reclaiming Process**

The mechanical reclaiming process, unlike the other two preceding processes, is continuous. The fine ground, fabric free rubber scrap is fed continuously into a high temperature, high shear machine. The discharged reclaimed rubber needs no drying and is ready for further processing. The envisaged plant uses the de-polymerization technology i.e. pans (heater) process and the process involves the following main steps:

✓ **De-beading**

Beads in scrap tires are removed manually for its further processing. In most of the existing plants, debeaded tires are being received.

✓ **Size Reduction**

De-beaded scrap tire is reduced by mechanical chopping or cracking on a very heavy cracker mill to a suitable size for the de-vulcanization step being used. The cracked ground stock is conveyed to a vibrating screen of a given mesh size. The oversized material is returned to the crackers for further grinding. The stock, which passes through the screen, is conveyed for the storage to use in the de-polymerization process. Some reclaiming plants use a series of screens, air separators and sizing equipment to remove/ reduce fiber content from ground rubber scrap.

✓ **De-polymerization (Devulcanization)**

Rubber scrap separation and size reduction is followed by appropriate de-polymerization process.

✓ **Final Processing**

The final stage of the reclaiming operations involves straining to remove foreign matter before going to refining and sheeting mill. The strainer is an extruder, which contains a wire mesh screen held between two strong perforated steel plates in the head of the machine. The reclaim is then given a preliminary refining on a short two-roll mill having a high-fraction ratio between the roll surfaces. The reclaim is then sheeted for the final thickness on a sheeting mill. Sheeted reclaim is cooled, dusted with talc to prevent sticking with each other, tested, packed and finally dispatched to the customer.

2. Environmental Impact Assessment

Steam, which is in contact with depolymerisation mass, is condensed to generate the primary source of waste water. Second major sources of contaminant loading are spills, leaks and wash down from processing areas. In dry process, fiber content of scrap tries mechanically removed resulting generation of airborne particulate matter in bulk particularly in grinding and cracking section. In the absence of efficient capture unit of these airborne particulate matters, it settles down on floor of processing area and find sits way to nearest drainage along with floor washing water. The discharge of spills, leaks and wash down from processing areas is qualitatively similar to the corresponding discharge of molded, extruded/calendared and fabricated products. However, contaminant loadings on daily basis are substantially higher. A third source of wastewater is from utility services such as boiler blow down, cooling tower/pond blow down, water treatment plant wastewater etc.

A fourth-minor source of contaminant loadings is air control equipment used to absorb uncondensed organic vapors leaving with steam. When absorbing materials such as activated carbon is regenerated with washing from water, this activity generates a wastewater stream with high organic content. Although these activities is twice or thrice in a year, waste water discharging is highly intermittent in nature.

The envisaged plant should adopt prevention of waste generation at the source instead of end of pipe treatment. The selected technology adopts this method but all the waste water to be

generated in spite of the effort of preventing waste at the source has to be treated in a properly designed waste treatment unit before released. The cost of waste water treatment system is included in the cost of machinery and equipment.

B. ENGINEERING

1. Machinery and Equipment

The total cost of machinery and equipment is estimated at Birr 25 million, out of which Birr 18.75 million is required in foreign currency. The list of machinery and equipment required for the envisaged plant is given in Table 5. 1.

Table 5.1

LIST OF MACHINERY & EQUIPMENT

Sr. No.	Description	Qty.
1	Cracker mill	1
2	Belt conveyer	1
3	Vibrating screen	1
4	Air separator	1
5	Storage tank	4
6	Mixer	1
7	Pressure cooker(Autoclave)	1
8	Strainer	1
9	Refiner roller	1
10	Sheeting mill	1
11	Cooler	1
12	Dusting machine	1
13	Rolling machine	1
14	Waste water treatment system	1 set

2. Land, Buildings & Civil Works

The total area required by the project is 3,000 m² of which 1,500 m² is built-up area. At the rate of Birr 5000 per m², the total cost of building and civil work is estimated at Birr 7.5 million.

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

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

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

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

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

Regarding land allocation of industrial zones if the land requirement of the project is below 5,000 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

Zone	Level	Floor Price/m²
	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 798,000 of which 10% or Birr 79,800 will be paid in advance. The remaining Birr 718,200 will be paid in equal installments with in 28 years i.e. Birr 25,650 annually

VI. HUMAN RESOURCE AND TRAINING REQUIREMENT

A. HUMAN RESOURCE REQUIREMENT

The total labor requirement of the envisaged plant is 101. The total annual labor cost is estimated at Birr 2,349,000. The list of human resource and labor cost are indicated in Table 6.1.

Table 6.1
HUMAN RESOURCE REQUIREMENT & COST

Sr. No.	Description	Req. No.	Salary (Birr)	
			Monthly	Annual
1	Plant manager	1	10,000	120,000
2	Secretary	2	4,000	48,000
3	Production and technical manager	1	8,000	96,000
4	Finance and administration manager	1	8,000	96,000
5	Commercial manager	1	8,000	96,000
6	Accountant	3	7,500	90,000
7	Sales person	2	5,000	60,000
8	Purchaser	2	5,000	60,000
9	Clerk	2	1,200	14,400
10	Quality control manager	1	7,000	84,000
11	Chemist	3	6,000	72,000
12	Production supervisor	3	6,000	72,000
13	Operator	18	27,000	

Sr. No.	Description	Req. No.	Salary (Birr)	
			Monthly	Annual
				324,000
14	Assistant operator	18	18,000	216,000
15	Mechanic	3	4,500	54,000
16	Electrician	3	4,500	54,000
17	Unskilled labor	9	5,400	64,800
18	Personnel	1	3,000	36,000
19	Time keeper	3	2,700	32,400
20	Store keeper	2	1,800	21,600
21	Driver	4	3,200	38,400
22	Guard	12	7,200	86,400
23	Cleaner	6	3,600	43,200
	Sub-total	101	156,600	1,879,200
	Employee benefit (25% BS)		39,150	469,800
	Total		195,750	2,349,000

B. TRAINING REQUIREMENT

On-the-Job training for production and technical workers on operation, quality and maintenance of machinery shall be carried out during plant erection and commissioning. Therefore, the cost of training is estimated at Birr 80,000.

VII. FINANCIAL ANALYSIS

The financial analysis of reclaimed rubber 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 46.56 million (see Table 7.1). From the total investment cost, the highest share (Birr 33.73 million or 72.45%) is accounted by fixed investment cost initial followed by working capital (8.68 million or 18.65%) and pre operation cost (Birr 4.15 million or 8.90%). From the total investment cost, Birr 18.75 million or 40.27% 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	79.80		79.80	0.17
1.2	Building and civil work	7,500.00		7,500.00	16.11
1.3	Machinery and equipment	6,250.00	18,750.00	25,000.00	53.70
1.4	Vehicles	900.00		900.00	1.93
1.5	Office furniture and equipment	250.00		250.00	0.54
	Sub total	14,979.80	18,750.00	33,729.80	72.45
2	Pre operating cost *				
2.1	Pre operating cost	1,100.00		1,100.00	2.36
2.2	Interest during construction	3,045.87		3,045.87	6.54
	Sub total	4,145.87		4,145.87	8.90
3	Working capital **	8,682.66		8,682.66	18.65
	Grand Total	27,808.34	18,750.00	46,558.34	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 12.52 million. However, only the initial working capital of Birr 8.67 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 49.05 million (see Table 7.2). The cost of raw material account for 69.89% of the production cost. The other major components of the production cost are depreciation, financial cost, utility, and labor which account for 11.67%, 5.98%, 5.36% and 3.64%, respectively. The remaining 3.46% is the share of cost of marketing and distribution, repair and maintenance, labor overhead and administration cost. For detail production cost see Appendix 7.A.2.

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

Items	Cost (in 000 Birr)	%
Raw Material and Inputs	34,285.50	69.89
Utilities	2,628.65	5.36
Maintenance and repair	712.50	1.45
Labour direct	1,785.05	3.64
Labour overheads	445.55	0.91
Administration Costs	190.00	0.39
Land lease cost	-	-
Cost of marketing and distribution	350.00	0.71
Total Operating Costs	40,397.25	82.35
Depreciation	5,725.00	11.67
Cost of Finance	2,931.65	5.98
Total Production Cost	49,053.90	100

C. FINANCIAL EVALUATION**1. Profitability**

Based on the projected profit and loss statement, the project will generate a profit throughout its operation life. Annual net profit after tax will grow from Birr 4.52 million to Birr 10.04 million during the life of the project. Moreover, at the end of the project life the accumulated net cash flow amounts to Birr 82.74 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.

$$\text{Break -Even Sales Value} = \frac{\text{Fixed Cost} + \text{Financial Cost}}{\text{Variable Margin ratio (\%)}} = \text{Birr } 24,024,420$$

$$\text{Break- Even Capacity utilization} = \frac{\text{Break- even Sales Value}}{\text{Sales revenue}} \times 100 = 40.38 \%$$

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 23.36% 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 32.64 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 101 persons. The project will generate Birr 24.25 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) sub sector and forward linkage with the reclaimed rubber user industries 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	25,263	30,677	34,286	36,090	36,090	36,090	36,090	36,090	36,090	36,090
Utilities	1,937	2,352	2,629	2,767	2,767	2,767	2,767	2,767	2,767	2,767
Maintenance and repair	525	638	713	750	750	750	750	750	750	750
Labour direct	1,315	1,597	1,785	1,879	1,879	1,879	1,879	1,879	1,879	1,879
Labour overheads	328	399	446	469	469	469	469	469	469	469
Administration Costs	140	170	190	200	200	200	200	200	200	200
Land lease cost	0	0	0	0	26	26	26	26	26	26
Cost of marketing and distribution	350	350	350	350	350	350	350	350	350	350
Total Operating Costs	29,859	36,182	40,397	42,505	42,531	42,531	42,531	42,531	42,531	42,531
Depreciation	5,725	5,725	5,725	5,725	5,725	325	325	325	325	325
Cost of Finance	0	3,350	2,932	2,513	2,094	1,675	1,256	838	419	0
Total Production Cost	35,584	45,257	49,054	50,743	50,350	44,531	44,112	43,693	43,274	42,856

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	40,041	48,621	54,341	57,201	57,201	57,201	57,201	57,201	57,201	57,201
Less variable costs	29,509	35,832	40,047	42,155	42,155	42,155	42,155	42,155	42,155	42,155
VARIABLE MARGIN	10,533	12,789	14,294	15,046	15,046	15,046	15,046	15,046	15,046	15,046
in % of sales revenue	26.30	26.30	26.30	26.30	26.30	26.30	26.30	26.30	26.30	26.30
Less fixed costs	6,075	6,075	6,075	6,075	6,101	701	701	701	701	701
OPERATIONAL MARGIN	4,458	6,714	8,219	8,971	8,945	14,345	14,345	14,345	14,345	14,345
in % of sales revenue	11.13	13.81	15.12	15.68	15.64	25.08	25.08	25.08	25.08	25.08
Financial costs		3,350	2,932	2,513	2,094	1,675	1,256	838	419	0
GROSS PROFIT	4,458	3,364	5,287	6,458	6,851	12,670	13,089	13,508	13,927	14,345
in % of sales revenue	11.13	6.92	9.73	11.29	11.98	22.15	22.88	23.61	24.35	25.08
Income (corporate) tax	0	0	0	1,937	2,055	3,801	3,927	4,052	4,178	4,304
NET PROFIT	4,458	3,364	5,287	4,521	4,796	8,869	9,162	9,455	9,749	10,042
in % of sales revenue	11.13	6.92	9.73	7.90	8.38	15.51	16.02	16.53	17.04	17.56

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	34,830	51,923	48,654	54,363	57,201	57,201	57,201	57,201	57,201	57,201	57,201	20,019
Inflow funds	34,830	11,882	33	22	0	0	0	0	0	0	0	0
Inflow operation	0	40,041	48,621	54,341	57,201	57,201	57,201	57,201	57,201	57,201	57,201	0
Other income	0	0	0	0	0	0	0	0	0	0	0	20,019
TOTAL CASH OUTFLOW	34,830	41,740	45,607	48,775	51,772	50,871	52,195	51,902	51,609	51,315	46,834	0
Increase in fixed assets	34,830	0	0	0	0	0	0	0	0	0	0	0
Increase in current assets	0	8,836	1,887	1,258	629	2	0	0	0	0	0	0
Operating costs	0	29,509	35,832	40,047	42,155	42,181	42,181	42,181	42,181	42,181	42,181	0
Marketing and Distribution cost	0	350	350	350	350	350	350	350	350	350	350	0
Income tax	0	0	0	0	1,937	2,055	3,801	3,927	4,052	4,178	4,304	0
Financial costs	0	3,046	3,350	2,932	2,513	2,094	1,675	1,256	838	419	0	0
Loan repayment	0	0	4,188	4,188	4,188	4,188	4,188	4,188	4,188	4,188	0	0
SURPLUS (DEFICIT)	0	10,183	3,046	5,588	5,429	6,330	5,006	5,299	5,592	5,886	10,367	20,019
CUMULATIVE CASH BALANCE	0	10,183	13,229	18,817	24,245	30,576	35,582	40,881	46,473	52,359	62,725	82,745

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	40,041	48,621	54,341	57,201	57,201	57,201	57,201	57,201	57,201	57,201	20,019
Inflow operation	0	40,041	48,621	54,341	57,201	57,201	57,201	57,201	57,201	57,201	57,201	0
Other income	0	0	0	0	0	0	0	0	0	0	0	20,019
TOTAL CASH OUTFLOW	43,512	31,713	37,418	41,015	44,445	44,586	46,332	46,457	46,583	46,709	46,834	0
Increase in fixed assets	34,830	0	0	0	0	0	0	0	0	0	0	0
Increase in net working capital	8,683	1,854	1,236	618	2	0	0	0	0	0	0	0
Operating costs	0	29,509	35,832	40,047	42,155	42,181	42,181	42,181	42,181	42,181	42,181	0
Marketing and Distribution cost	0	350	350	350	350	350	350	350	350	350	350	0
Income (corporate) tax		0	0	0	1,937	2,055	3,801	3,927	4,052	4,178	4,304	0
NET CASH FLOW	-43,512	8,328	11,203	13,326	12,756	12,615	10,869	10,744	10,618	10,492	10,367	20,019
CUMULATIVE NET CASH FLOW	-43,512	35,184	-23,981	10,656	2,100	14,715	25,585	36,328	46,946	57,439	67,806	87,825
Net present value	-43,512	7,571	9,259	10,012	8,713	7,833	6,135	5,513	4,953	4,450	3,997	7,718
Cumulative net present value	-43,512	35,941	-26,683	16,671	-7,958	-125	6,010	11,523	16,477	20,926	24,923	32,642

NET PRESENT VALUE 32,642
INTERNAL RATE OF RETURN 23.36%
NORMAL PAYBACK 5 years