39. PROFILE ON PRODUCTION OF NATURAL RUBBER LATEX FROM RUBBER TREE

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I. SUMMARY

This profile envisages the establishment of a plant for the production of natural rubber latex with a capacity of 1,000 tonnes per annum.

The present demand for the proposed product is estimated at 2,566 tonnes per annum. The demand is expected to reach at 7,756 tonnes by the year 2017 .

The plant will create employment opportunities for 36 persons.

The total investment requirement is estimated at Birr 3.64 million, out of which Birr 1.16 million is required for plant and machinery.

The project is financially viable with an internal rate of return (IRR) of 28.56 % and a net present value (NPV) of Birr 3.37 million discounted at 8.5%.

II. PRODUCT DESCRIPTION AND APPLICATION

Rubber latex is used to produce various natural rubber products such as tyres, inner tubes etc. Natural rubber is tapped from rubber tree. The region has huge potential for the development of rubber plantation.

III. MARKET STUDY AND PLANT CAPACITY

A. MARKET STUDY

1. Past Supply and Present Demand

Rubber latex is the major raw material used to produce tyres and inner tubes in the country. General rubber goods such as door mats, automotive accessories, out-soles and the like are also produced from rubber latex. The major end user of rubber latex is

Matador Addis, which used to be known as Addis Tyre S.C before the joint venture arrangement with Slovak Matador in April 2004.

The country's requirement of natural rubber latex is entirely met through import. According to the data collected from the Customs Authority, the types of natural rubbers imported to Ethiopia include in primarily forms or in plates, sheets or strips, smoked sheets and other natural rubbers. The quantity and value of natural rubber imported in the past 10 years is presented in Table 3.1.

Table 3.1.

IMPORT OF NATURAL RUBBER

Year	Quantity (Tonnes)	Value (Birr)
1997	1,916.8	18,268,109
1998	4,175.0	28,948,024
1999	1,536.7	10,022,187
2000	2,388.5	15,369,646
2001	4,530.0	28,503,834
2002	1,280.5	7,221,880
2003	3,442.8	16,796,752
2004	1,669.0	19,578,261
2005	2,647.0	34,662,706
2006	1,922.6	35,217,101

Source:- *compiled from Customs Authority.*

The data presented in Table 3.1. does not show any trend on the import of natural rubber. The imported quantity rages from the lowest figure of 1,280.5 tonnes in the year 2002 to the highest figures of 4,530 tonnes in and 4,175 tonnes during 2001 and 1998, respectively. In the remaining years, the imported quantity is in the range of 1,536.7 tonnes and 3,442.8 tons. The high imports in some years is an indication of holding

enough stock for the following years. That is why high quantity of import in some years are followed by low import in other years.

Since the current major user of natural rubber tatex is Matador Addis and its capacity has been almost constant in the past 10 years, the average quantity imported in the past 10 years has been taken to fairly reflect the current effective demand. Accordingly, the current effective demand for natural rubber latex is estimated at 2,566 tonnes.

2. Projected Demand

The demand for natural rubber depends on the production of tyres, inner tubes and other rubber based products. In recent years, Matador Addis has been undertaking an expansion project to double its tyre production, i.e., from about 240,000 tyers to about 500,000 tyers. This means that the demand for rubber latex will increase in parallel. Hence, the demand for rubber latex will be doubled as a result of the expansion programme of Matador-Addis. When the expansion programme is fully operational, the demand will increase to about 5000 tonnes of rubber latex per annum. Taking this as a base and assuming annual growth rate of 5%, due to other users and new entrants in rubber goods production, the projected demand is shown in Table 3.2.

Table 3.2.

PROJECTED DEMAND FOR NATURAL RUBBER LATEX (TONNES)

Year	Quantity
2008	5,000
2009	5,250
2010	5,512
2011	5.788
2012	6,077
2013	6,381
2014	6,700
2015	7,035
2016	7,387
2017	7,756

Demand for rubber latex will increase from 5,000 tonnes in 2008 to 6,077 tonnes and 7,756 by the year 2012 and 2017, respectively.

3. Pricing and Distribution

The CIF price of imported natural rubber in the past three years range from about Birr 6,730 to Birr 8,317 per tonnes Accordingly, a selling price of Birr 7,130 per tonne is adopted for sales revenue projection. Since the major end users of the product are very limited in the country, direct sale with out intermediaries is recommended.

B. PLANT CAPACITY AND PRODUCTION PROGRAMME

1. Plant Capacity

The market study indicates that the demand for natural rubber latex in 2008 will be 5000 tonnes. This demand is shown to grow to 7035 tonnes by the year 2015, and then to 7,756 tonnes by the year 2017. Based on this trend, and considering that the envisaged plant will share only 20% of the market, it is proposed that plant capacity will be 1,000 tonnes per annum. The plant will operate single shift of 8 hours a day and 300 days a year. Production can be doubled if the plant is operated 16 hours a day without making any substantial change in fixed investment.

2. Production Programme

It is proposed that production build-up will be carried out starting from lower production capacity so as to given time for skill development and attain good share of the market. Thus, the plant will start operation at 65% of installed capacity during the first year, and then will grow to 75%, 85% and 100% in the second, third and fourth year and then after, respectively. The detailed production build-up is given in Table 3.3.

Table 3.3

PRODUCTION PROGRAMME

Year	**1**	**2**	**3**	**4 and above**
Capacity utilization (%)	65	75	85	100
Production (tonnes)	650		850	1000

IV. MATERIALS AND INPUTS

A RAW AND AUXILIARY MATERIALS

The major raw material required for the production of natural rubber latex is rubber tree. According to the resource potential assessment conducted by IPS (Part I – Vol.III – FORESTRY, TOURISM & WATER RESOURCE -2005/2006), projects on rubber tree plantation are being carried out in Bench –Maji, Sheka zone. The study further indicated that rubber trees are also found in some areas of SNNPRS in scattered form. Thus, the study warrants that there is sufficient rubber plantation to produce rubber gum to be used as raw material for rubber latex production. Another option is to encourage rubber small holders to produce rubber gum and supply same to the envisaged plant.

Auxiliary materials required for the processing plant include coagulating chemicals, anit-coagulants, and other inputs. The raw and auxiliary materials requirement details are given in Table 4.1.

Table 4.1

RAW AND AUXILIARY MATERIALS REQUIREMENT AND COST AT FULL CAPACITY

Sr. No.	Description	Qty	Cost ('000 Birr)		
			LC	FC	TC
	A. Raw Material				
1	Rubber gum (ton)	1005	5025	-	5025
	Sub –total		**5025**	**-**	**5025**
	B. Auxiliary Material				
1	Anit-coagulants	Reqd	-	65	65
2	Formic acid	Reqd	-	35	35
3	Ammonia (preservative)	Reqd	-	75	75
4	Other inputs	Reqd	-	15	15
	Sub-total			**190**	**190**
	Total	**-**	**5025**	**190**	**5215**

B. UTILITIES

Electricity, water, fuel oil and lubricants are utilities required for the processing plant. Annual quantity of each and cost are given in Table 4.2 below.

Table 4.2

ANNUAL REQUIREMENT OF UTILITIES AND COST

Sr. No.	Description	Qty	Cost ('000 Birr)
1	Electricity (kWh)	250,000	118.40
2	Water (m3)	5,000	50.00
3	Fuel oil (litres)	10,000	54.10
4	Lubricant (kgs)	500	2.50
	Total	**-**	**225.00**

V. TECHNOLOGY AND ENGINEERING

A. TECHNOLOGY

1. Production Process

The production process of natural rubber latex consists of two major operations, namely:-

a) Dry rubber production, and

b) Processing of natural rubber.

a) Dry Rubber Production

Tapping rubber trees: -Havea trees are not tapped any more often than once per day, with 2 or 3 days being the norm. In countries such as Thailand, tapping usually takes place in the early hours of the morning, prior to dawn due to the high day time temperatures, and the protective clothing worn to protect against snakes, etc. Also flow rates are increased due to high turgor pressures at these times.

A tapper uses a sharp hook-shaped knife to shave a thin layer of fresh bark from the tree. This exposes the latex vesicles. The cut is typically done at 25-30^{o} to the horizontal, as this exposes the maximum number of vesicles. The same incision is re-opened the next time (typically the next day) by shaving off a small amount of bark. Virgin bark is exposed first working around in panels. The same area may be exploited again after about 7 years.

The thickness of the layer is important as too thick a slice will damage the tree and reduce its productivity and life, while too thin a slice will not produce sufficient latex.

Bark is removed in a localized area for a period of time, and then a new area is tapped allowing the tree to repair itself.

The latex runs down and is collected in a cup. Each tree usually produces about half a cup of latex per day and is collected later in the day. Latex will flow for approximately 1 to 3 hours after which time the vesicles become plugged with coagulum.

b) Processing of Natural Rubber

Processing of natural rubber involves the addition of a dilute acid such as formic acid. The coagulated rubber is then rolled to remove excess water. Then a final rolling is performed using a textured roller and the resultant rubber sheet is dried. The rubber sheet thus produced is preserved using a chemical such as ammonia. Following this, the rubber is ready for market. This type of natural rubber accounts for about 90% of natural rubber production. The rubber latex thus produced is used for making products such as: glue, tyres, toys, shoes, condoms, gloves, catheters, balloons, some medical tubing and elastic thread.

2. Source of Technology

Address of machinery supplier form India is shown below:
Trimity Engineering Pvt. Ltd.
Mumbai-401.210, Maharashtra, INDIA
Tel: +(91)-(250)-2391 486/28738615
Fax: +(91) – (250) – 2391227/28738615
E-mail: autoparts@vsne.com.

B. ENGINEERING

1. Machinery and Equipment

Machinery and equipment required by natural rubber latex processing plant and related cost is indicated in Table 5.1 below. This project does not incorporated machinery and equipment required for farming rubber plantation.

Table 5.1

MACHINERY AND EQUIPMENT REQUIREMENT AND COST

Sr. No.	Description	Qty	Cost ('000 Birr)		
			LC	FC	TC
1	Tapping knife – sharp hook-shaped (pcs)	10	-	5.0	5.0
2	Latex collecting cup (pcs)	20	-	6.0	6.0
3	Transportation tank (pcs)	4	-	200.0	200.0
4	Sheeting battery	1	-	210.0	210.0
5	Coagulating tank	10	-	400.0	400.0
6	Bulking tank	4	-	200.0	200.0
7	Plat form scale	1	4.0	-	4.0
8	Baling press	2	6.0	-	6.0
9	Baling box	20	10.0	-	10.0
10	Other auxiliary equipment	Reqd	25.0	-	25.0
	FOB price		45	1,021.0	1,066.0
	Freight, Insurance , Customs and Bank charges, material handling cost		100.0	-	100.0
	CIF Landed Cost		**145**	**1021.0**	**1166.0**

2. Land, Building and Civil Works

Land requirement for the processing plant does not include rubber tree plantation area. Consequently, land required for processing plant, for future expansion, for constructing stores, for auxiliary buildings and path ways is estimated to be 5000 m^2. Of this built-up area will be 1,000 m^2. At land lease rate of Birr 3.0 per m^2, and unit cost (per m^2) of building of Birr 1,500 million, the total investment on land, building and civil works will be Birr 1.9 million.

3. Proposed Location

Location is determined on the basis of proximity to raw materials, availability of infrastructure and distance of plant from potential market outlets. Moreover, consideration of fair distribution of projects among SNNPRS woredas is taken. Accordingly, seven woredas, namely, Menjewo, Tello, gimbo, Bencha, Sheko, Maji and Guraferda were identified. Of these, Tello woreda is selected. It is then proposed that the envisaged plant will be established in Ada town.

VI. MANPOWER AND TRAINING REQUIREMENT

A. MANPOWER REQUIREMENTS

The processing plant requires both production workers (skilled and unskilled) and administrative personnel. The details of manpower required by the plant together with monthly salary and annual wages is shown in Table 6.1 below.

B. TRAINING REQUIREMENT

Operators that will be engaged on the processing equipment will have to be trained to acquire the requisite skill of operation. The training programe will be part of the contractual agreement with the machinery supplier. Thus, it is intended that a two-weeks training will be conducted during erection and commissioning period. A total of Birr 10,000 is allotted to conduct the training programme.

Table 7.1

MANPOWER REQUIREMENTS AND LABOUR COST (BIRR)

Sr. No.	Job Title	Req. No.	Monthly Salary	Annual Wages
	A. Administration			
1	Plant manager	1	2,000	24,000
2	Secretary	1	600	7,200
3	Personnel officer	1	800	9,600
4	Sales man	1	800	9,600
5	Store man	1	800	9,600
6	Cashier	1	500	6,000
7	Accountant	1	800	9,600
8	General Services	4	250	12,000
	Sub total	**11**		**876,000**
	B. Production			
1	Production Supervisor	1	1,200	14,400
2	Rubber technologist	1	1,200	14,400
3	Skilled workers	10	500	60,000
4	Unskilled	6	250	18,000
5	Technicians	2	600	14,400
	Sub-total	**25**		**121,200**
	Workers' Benefit (25% BS)			52,200
	Total	**36**		**261,000**

VII. FINANCIAL ANALYSIS

The financial analysis of the natural rubber latex 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	5 years
Bank interest	8.5 %
Discount cash flow	8.5%
Accounts receivable	30 days
Raw material local	30 days
Work in progress	3 days
Finished products	30 days
Cash in hand	10days
Accounts payable	30 days

A. TOTAL INITIAL INVESTMENT COST

The total investment cost of the project including working capital is estimated at Birr 3.64 million, of which 29 per cent will be required in foreign currency.

The major breakdown of the total initial investment cost is shown in Table 7.1.

Table 7.1

INITIAL INVESTMENT COST

Sr. No.	Cost Items	Total Cost ('000 Birr)
1	Land lease value	400.0
2	Building and Civil Work	1,500.0
3	Plant Machinery and Equipment	1,166.0
4	Office Furniture and Equipment	50.0
5	Pre-production Expenditure*	376.0
6	Working Capital	157.9
	Total Investment cost	**3,649.9**
	Foreign Share	29

** N.B Pre-production expenditure includes interest during construction (Birr 220.19 thousand) training (Birr 10 thousand) and Birr 105 thousand costs of registration, licensing and formation of the company including legal fees, commissioning expenses, etc.*

B. PRODUCTION COST

The annual production cost at full operation capacity is estimated at Birr 6.21 million (see Table 7.2). The material and utility cost accounts for 87.62 per cent, while repair and maintenance take 2.15 per cent of the production cost.

Table 7.2

ANNUAL PRODUCTION COST AT FULL CAPACITY ('000 BIRR)

Items	Cost	%
Raw Material and Inputs	5,215.00	84.00
Utilities	225	3.62
Maintenance and repair	133.3	2.15
Labour direct	173.4	2.79
Administration Costs	87.6	1.41
Total Operating Costs	5,834.30	93.97
Depreciation	227.76	3.67
Cost of Finance	146.39	2.36
Total Production Cost	**6,208.45**	**100**

C. FINANCIAL EVALUATION

1. Profitability

According to the projected income statement, the project will start generating profit in the first year of operation. Important ratios such as profit to total sales, net profit to equity (Return on equity) and net profit plus interest on total investment (return on total investment) show an increasing trend during the life-time of the project.

2. Break-even Analysis

The break-even point of the project including cost of finance when it starts to operate at full capacity (year) is estimated by using income statement projection.

$$BE = \frac{\text{Fixed Cost}}{\text{Sales} - \text{Variable Cost}} = 40\ \%$$

3. Pay Back Period

The investment cost and income statement projection are used to project the pay-back period. The project's initial investment will be fully recovered within 4 years.

4. Internal Rate of Return and Net Present Value

Based on the cash flow statement, the calculated IRR of the project is 28.56 % and the net present value at 8.5 % discount rate is Birr 3.37 million.

D. ECONOMIC BENEFITS

The project can create employment for 36 persons. In addition to supply of the domestic needs, the project will generate Birr 1.59 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.