PROJECT REPORT ON A SMALL SCALE UNIT

TO MANUFACTURE

TREAD RUBBER

SUBMITTED TO THE UNIVERSITY OF COCHIN

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by

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SECTION-A

INTRODUCTION

Tread rubber which is known as camelback is the third large scale item of rubber products manufactured in India. Tread rubber is used for retreading of worn-out tyres. Usually the tyres can be retreaded as many as four to six times, depending upon the casing strength.

Due to constant friction between the tread portion of the tyre and the surface of the road, while in motion, the original tyre wears out. Retreading is done by applying the extruded slab of rubber compound to the casing of the tyre and vulcanizing on tyre moulds using steam. The camel back when ultemately cured in the retreading process should have the qualities of the original tread of the tyre. Hence good technical skill is required for the production of good quality tread rubber.

The tread rubber is supplied either as 'Box Rubber' which is a standard package of cushion backed. Tread stock coiled in a polythene liner or as a separate packages of cushion gum tread stock. The cushion gum assures good adhesion of new tread to carcass, is generally 1/32" thick.

There are three types of tread rubber, classified according to the cross-sectional shape. They are:-

(1) slab type - straight edge and Bevel stock.

(2) Wing type or camel back.

(3) Valley type or Double hump.

These three types are shown diagramatically in Appendix I. All those types are available in various dimension, to suit the retreading of various sizes of tyres. The dimensions are expressed as follows. The width of base and crown and gauge are expressed in inches or in m.m. Thasfirst the width (crown followed by base) and then the gauges (gauge at center followed by gauge at shoulder) are given in two to four sets of numerals depending upon the type of slab or camel back. The common types of camel back are given in Appendix - II.

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SECTION-B

MARKET SURVEY

Camel back is one of the major items manufactured in India. The actual production of this item is calculated on the basis of the rubber consumption. The production of tread rubber during the period 1975- 79 and consumption of all kinds of rubber for that is shown in Table 1.

Table-1: PRODUCTION OF TREAD RUBBER

Year	Consumption of Rubber (MT)				Production of camel back (MT)
	N.R.	Synthetic rubber	Reclaimed rubber	Total	
1975	5545	2303	682	8530	11,853
1976	7386	1642	927	9955	12,245
1977	7332	1701	941	9974	11,066
1978	8771	1840	1152	11763	11,812
1979	-	-	-	-	14,027

Source:- Rubber News.

From the above figures, it may be observed that there was a 4.6% growth rate in the production of tread rubber ever 1975-79 period, except in 1977 which was due to increase in oil prices. However, since 1975, the demand is picking up. As this is a steady trend, it is anticipated that the growth rate would continue in future as well. Accordingly, the

likely demand during 1981-85 period is estimated at 5% growth rate and presented in Table 2.

Table-2. ESTIMATED DEMAND FOR TREAD RUBBER

Year	Demand (MT)
1981	15,500
1982	16,300
1983	17,100
1984	18,000
1985	18,900

The production of automobile tyres has increased from 55.64 lakh nos. to 70.9 lakh nos. during 1975-79 period showing a growth rate of 5.5%. The propertion of tyre and tread rubber production during the above referred period increased from 0.41 tyres/kg to 0.51 tyres/kg out put of tread rubber.

As per the guidelines for industries 1978-79, the likely demand for automobile tyres by 1982-83 is expected to increase to 13 million nos. The corresponding demand for tread rubber is estimated as 35,500 MT. The installed production capacity in the medium and large scale sector is 17,550 tones. At present tread rubber is reserved for production in the small scale sector and hence it may be presumed that installed capacity in the medium and large

scale sectors will remain same.

Due to competition from units in the medium and large scale sectors, the units in the small scale sector were operating under comparitively lower levels of utilisation than that could be achieved. However, the small scale sectors is expected to improve their performance.

Users and Customers Analysis:-

The retreading industry is the sole consumer of this item. There are number of retreading units and majority of the units are in the small scale sector and are situated in principal towns in the country. The major retreading companies in Kerala and Tamilnadu are the Stanes Tyres, Calicut Retreading Corporation, Annamalai Retreading Company and T.V.S.

MARKETING OF THE PRODUCT:-

The large scale manufactures have their own established methods of selling the product, through sales depots. For the small concerns selling through dealers, through agents on commission basis or entering into short or long time contracts with consumers seems.to be the best methods of selling the product. Sales depots are too expensive for a small concern.

Another important part to be played by the manufactures in marketing is to give the necessary information and service to consumer, regarding the efficient way of using the tread rubber for retreading. The success of the retread depends not only on the quality of the tread rubber but to a

great extend on the retreading operation. Hence the manufactures is expected to be also an expert in the retreading operations. This will always help to get confidence of the consumers.

The Camel back Unit:-

On the basis of what has been stated about it would appear suitable to start a small scale unit to produce 400 tonnes of cushion backed camel back and slab, and 100 tonnes of cushion gum per annum. For the scheme envisaged all the machinery and raw materials are available indiginously except insoluble sulphur which has to be imported. Since Camelback is an excisable item, a licence from the Central Excise Department is necessary. The labour can be trained easily in processing operations and skilled labour is required to a very small extent.

Product Pricing:-

The price per kilogram is usually quoted. The selling price is the total of basic price, excise duty and sales tax. The selling price of cushion backed camelback and cushion gum are given in Annexure - B-1.

Since the tread produced by this unit is of high quality the marketing strategy is cost oriented.

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CONTENTS

SECTION-C

PRODUCTION REQUIREMENTS

1. LOCATION:-

Decision of location is very important in any industrial undertaking sincea plant is relatively immobile and once it is established it is permanent. For this tread rubber unit the best location seems to be Kerala where there is ample supply of raw materials, power and water. Transport convenience and availability of labour is another two important factors.

2. RAW MATERIAL REQUIREMENTS:-

The amount of raw materials are calculated based on the following production pattern

Tread Rubber compound	400 M.tonnes/year.
Cushion Gum compound	100 M.tonnes/year
Total	500 M. tonnes/year

The annual requirement of each item is calculated in Annexure II-1 & Annexure II-2 based on the typical formulation for tread and cushion gum.

Packing materials:-

The cost of packing materials works out to be Rs.6,44,600.00 And it is shown in Annexure II-3

3. MAN POWER REQUIREMENTS:-

The personal requirements are summarised in Annexure-III-1.

The total number of personnel 38. There are 29 labours out of which 7 are skilled, 2 are semiskilled and 20 are unskilled. The total annual cost towards wages and salaries works out to be Rs.2,50,000.00

4. LAND AND BUILDING:-

(a) Land:-

The total land required is estimated as 2500 sq.m. The cost of 2500 sq.m. of land works out to be Rs.38,000.00

(b) Building:-

The requirement of built up area is estimated to be 750 sq.m. The cost of building including water tank is estimated as Rs.3,77,500.00 The total cost of land and building works out to be Rs.4,15,500.00 and it is shown in Annexure IV-1.

5. PLANT AND MACHINERY REQUIREMENTS:-

The main items of plant and machinery are listed in Annexure -V-1. The total cost of plant and machinery is worked out to be Rs.6,72,000.00

Terms and conditions of purchase:-

Quotations are invited and orders finalised for the satisfactory ones. The quoted prices are exclusive of packing charges, transportation charges, insurance, sales tax, excise duty etc. The delivery period for the major item will be 10 - 12 months. 30% of the price must be advanced at the time of finalising the order and the balance after inspection of machinery at the factory.

Source of supply:-

A list of suppliers of the various machinery required for the production is given in Appendix-III.

Capacity:-

The capacities of the main items of machinery are given below:-

16" x 42" mill	80 kg/hr.
12" x 30" mill	35 kg/hr.
4½" extruder	100-150 kg/hr.
6" x 22" calander	25'/min.

6. UTILITIES:-

The utilities include water and power.

Water:- Water is required in the factory for the following purpose.

(a) Cooling the mixing mills, extruder, calander and circulation in the cooling tank.

(b) Toilet and for washing purposes.

The total water requirement/shift is calculated and it is shown in Annexure VI-1. The total quantity of water required per day will be about 75 kilo litres.

Power:- Electricity is the main source of power. Power tapped from a high tension line through a transformer is used. The power requirement is calculated to be 76 KW which is shown in Annexure -VI-2. And the capacity of the transformer to be used is 125 KWA

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SECTION-D

DESCRIPTION OF PROCESS OF MANUFACTURE

1. Compound Design and choice of Ingredients:-

The design of compound for tread rubber and chus cushion gum is very important. The processing and service properties, cost factors and availability of raw materials are the main considerations for designing the compound. The service properties required in a tread compound vulcanisate are (1) High wear resistance (2) High Crack and Tear resistance (3) Good flex fatigue resistance (4) Low heat build up and resistance to oxidative degradation (5) High wet skid resistance (6) Low rolling resistance. The desirable processing properties are Tack, Low, nerve, Safety, Good dimensional stability and excellent storage life. The properties required in a cushion gum compound vulcanisate are Low modulus, Low heat build up etc. The processing properties required are excellent tack, safety, good storage life etc.

Polymer Selection:-

NR is used for heavy duty tread rubber because of its low heat build up. For light duty treads NR, SBR or a blend of both can be used. Reclaimed rubber (High quality WTR) is generally used in tread compounds at the level of 10 to 20 phr. For cushion gum at the compounds NR is the best choice. Reclaim upto 30 parts can be used along with N.R.

Fillers:-

The fine particle size Furnace blacks are used in

tread compound. HAF black is the most commonly used one. The ISAE and SAF blacks give better wear performance at higher cost. The lower reinforcing grades such as GPF, FEF, SRF blacks or a blend of them is used in cushion gum compounds.

Process aids:-

The main types of plasticisers and softeners used in tread rubber are :-

(i) Petroleum oils

(ii) Pine tar

(iii) Special plasticisers.

Aromatic oils are the best choice from petroleum oils because of their compatibility. Pine tar is conventionally used in NR tread rubber compounds because it imparts excellent tackiness and improves storage life. But it is not used with SBR compounds. Also pine tar is cheaper than petroleum oils. In Cushion Gum compound pine tar gives the best processing properties.

Protective system:-

The protective agents include antiozonants, anti-oxidants, antiflex-cracking agents and antiheat aging agents. Under Indian conditions, it is not necessary to add an antiozonant. Hence system to protect the tread from oxygen, flaxing and heat is used. Usually a blend of protective agents give the desired properties. Examples of the commonly Used protective agents are Nonox BL. Sandoflex AW, Antioxident 4010 NA etc. In passenger tyre cushion gums Nonox D can be

used effectively. Wax used at the level of 1 phr gives protection against static Ozone. It also functions as a process aid and surface finishing agents.

Vulcanisation system:-

The accelerator must be chosen to give maximum storage life good scorch safety and at the same time a high cure rate. The Sulphenamide type of accelerators give the desired properties. Vulcacit DZ, Vulcacit CZ, Vulcacit NZ, and Vulcacit MOR can be used. Out of the above four accelerators, Vulcacit DZ gives the maximum storage life. Sulphur used must be of the insoluble type to prevent blooming during storage. The processing temperature of the tread and cushion gum should not exceed 90° C since the insoluble sulphur will be converted to its soluble form above this temperature.

Other additives:-

These include peptisers and retarders. Peptisers are not usually used in mill mixing. Retarders are not necessary at low processing temperatures. The nitroso amine type creates problems of porosity. The best suited types are those based on treated phthalic anhydride due to its high Melting point.

Process of manufacture:-

The process involves the following steps. A flow diagram for the process of manufacture is givenin Appendix-IV.

1. Compounding.
2. Mixing.

3. Cooling and maturing.
4. Pre-warming.
5. Extruding.
6. Cushion gum preparation
7. Cushion application.
8. Cooling.
9. Packing and despatch.

METHOD OF MANUFACTURE:-

Compounding:- The rubber and other ingredients are weighed out as per the predetermined formula and batch weight. (The batch weight for a 16" x 42" mill is about 40 kg.) Typical formulations for tread and cushion gum and the weight of ingredients for a 40 kg batch are shown in Annexure-D-1.

Mill Mixing:- The following points are to be taken in to account during mixing. Zinc oxide is very defficult to disperse and hence it is added together with antioxidants immediatly after the band formation. Stearic acid must be added alongwith the first addition of black, but never with the ZnO. Oil should be added alongwith the carbon black. The accelerator must be added towards the end of the mixing cycle, just before the addition of sulpher. When blends of two polymers are used, the blending should be done at comparable viscosities. The mill should be cooled properly during mixing. After mixing the stock should be sheeted out, the chalked, cooled and kept over night for maturation.

Pre Warming:-

The matured compound is again warmed on a mill. It is done on the 12" x 30" mill. After pre-warming, strips of required width are cut from the mill and the strips are collected on racks.

Extrusion:-

The cut strips is then immediatly transfered to the extruder manually. The head and die of the extruder are designed dimensions to the product. The inner part of the flat head should be polished and dead angles must be avoided. The dimensions of the die are never those of the product. The die-swell characteristics of the compound, stretch or tontraction at the take off conveyer etc. are to be taken in to account when designing the die. Usually the die has dimensions about 75 to 85% of those of the camel back.

The screw and barrel of the extruder are always cooled. The barrel temperature range from 40 - 50°C. The head should have a temperature of 90 - 100°C To avoid cracks in the side wall part of the extrudate which may arise due to higher head pressure additional outlets are provided on both sides of the die-ledge. The die ledge plates are heated using a gas burner at the start to get a smother and faster extrusion.

Cooling:-

The tread coming from the extruder is at a temperature of 90 - 100°C. So it must be cooled as fast as possible to avoid any set up. This is accompalished by passing the camelback

under water in a cooling tank of about 40 - 60' length. After cooling, the water adhering tothe treadrubber is drained of by blowing air. The final temperature should not be more than 35°C.

Cushion application:

The extruded tread passed over a take off conveyer and then over a roller conveyer. The cushion gum with liner is applied continuously from below and consolidated from above by means of a pressure roller known as "Biscuit Roller" consisting of many discs providing a proper adjustment to the surface the camelback. Care should be taken to prevant any air entrapment in between the tread and the cushion gum.

Packing and Despatch:-

The camelback is then rolled in a coil form and cut to the required packing weight. The coil of tread rubber is covered with a mk polythene cover and packed in paper boxes or tin drums. The pack should contain a slip indicating the name of supplier, size of product and date of manufacture.

Preparation of Cushion Gum:-

The rubber is masticated and mixed with the ingredients on the 16" x 42" mill. After cooling and maturation the stock is pre-warmed on the 12" x 30" mill and strips of suitable size are cut from the mill. It is then fed to the nip between the top and middle rolls of the calender. The nip should be adjusted to get the required thickness. The temperature for smooth calendering range from 60 - 70°C. The third bottom roll

is usually cooled. The calendered sheet passed round the third roll on which it is cut to definite width and the material is passed on to a conveyer running in line with the calender. At the further end of the conveyer it is rolled in coil form with a polythene cover and packed in tins. The cushion gum for application to the bottom of the tread rubber should be rolled in to big coils. The tins of cushion gum are again packed in wooden boxes and marketted. Each pack contains about 20 - 30 tins.

Quality Control:-

Quality control is necessary to produce products of uniform and consistent quality. The checks generally used are

(1) Specific Gravity. This ensures that others are no gross inacceeracies in making the compound and that the camel back is not porous

(2) Cure characteristics. These are checked by means of step cures. Camelback is vulcanised in a press for different times and the rate of modulus development in vulcanisate is checked. Instead of stress measurement at depute elongation, for sake of simplicity, the strain at a definite stress (eg. hanging a known weight) is measured.

(3) Tensile strength. This test gives a measure of thoroughness of dispersion of the ingredients and it is advisable to check certain batches at random especially when new suppliers of raw materials are to be used.

(4) Storage life. There are no short and quick methods of determination of this quality. Mooney scroch time can

give a qualitative indication.

5. Raw material control. All the raw materials are to be checked for their, purity, solubility, volatile matter, melting pointe etc. are some of the control tests usually employed

Camelback is not covered under ISI specification, but is specified under German Standards (DIN 7751) The following properties are desired at the levels mentioned.

a) Mooney viscosity ML 4 100°C.	30-45
b) Mooney scroch time, 5 pint rise at 126°C	20-30 minutes
c) Cure time 152°C (18" thick test slab)	30 minutes.
d) shore hardness	58 -65
e) Modulus (300%)	90-120 kg/cm^2
f) Angle tear strength	30-60 kg/cm

Process loss:- There is practically no loss during process except the fly loss and handling ~~at~~ loss of the raw materials. The extruded tread not meeting the dimensional specifications can be replasticised and used again. Similar treatment is given to the stock coming through additional outlets in the die. But this should be mixed with the fresh stock in controlled proportions. The raw material waste during mixing, handling and storage is taken to be 2% and is accounted for in the section on Raw materials.

Plant lay-out:-

Plant layout has considerable influence on the operating cost. A layout for the plant and machinery is given in Appendix - V.

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SECTION- E

CAPITAL REQUIREMENTS

(1) Fixed capital:-

Fixed capital is the sum of expenses for land & building, plant and machinery, other fixed assets and pre-operative expenses. It is shown in Annexure - E-1. Other fixed Assets and pre-operating expenses are shown in Annexure - E-2, and Annexure - E-3, respectively

(2) Working capital:-

Working capital is the working expenses for a definite period (usually 2-3 months) which depends on the time required to market product and get the sales value. Working capital includes raw materials, salaries and wages, utilities and other overheads. The working capital requirement calculated on two months basis is shown in Annexure-E.4. Other overheads shown in Annexure-E-5.

Financing Plan:-

The financial institutions and nationalised banks in India will provide major portion of the investment. The financial institutions usually provide upto 85% of the fixed capital requirements. The pay back period varies from 8-10 years and the interest charge is 12%.

Banks provide 100% of the working capital and the interest varies from 14 - 16%.

The various financial institutions giving loan is given below:-

1. Kerala State Financial Corporation.

2. State Small Industries Development Corporation.

3. National Small Industries Corporation, New Delhi.

4. The Industrial Development Bank of India.

Financing plan for the project:-

Block loan from KFC (85% of fixed capital) Rs.10,00,000/-

Cash loan from Bank (working capital 100%) Rs. 10,56,000/-

Balance contributed by entrepreneur (15% of fixed capital) Rs. 1,75,000/-

Profitability and Economic Viability:-

The financial viability of a project can be examined through an analysis of the profitability. The following factors are considered in the section-

(1) Annual gross profit.

(2) Rate of return on own capital.

(3) Rate of retun on capital employed.

(4) Percentage profit on net sales.

(5) Interest commitments.

(6) Ability to payback loans and pay back period.

(7) Breakeven analysis.

Annual Gross Profit:-

Annual gross profit is the difference between Net sales and annual cost of product. The annual cost of production is estimated to be Rs.69,20,810.00

The net sale is Rs. 72,15,000.00

Hence the gross profit is Rs. 2,94,190.00

It is shown in Annexure E-6.

Annual cost of Production:-

The annual cost of production is Rs.69,20,810.00

It shown in Annexure-E-7.

Ability to Payback loans - Pay Back period:-

The term loan has to be paid back in the prescrined time. In this project the amount of term loan is Rs.10 lakh (block loan). The banks do not insist on the pay back of working capital loan within a prescribed time. Hence the 75% of the available surplus is usually used for the pay back and the rest is retained by the entrepreneur. It is shown in Annexure E-8.

Break even Analysis:-

Break even production is one at which there is no profit no loss. A knowledge of the break even point is always desirable for efficient operation. The break even point is calculated using the formula

$$BE = \frac{F}{P - V}$$

BE = Break even production (tonnes/year)

F = Fixed costs per annum.

P = Selling price/M.T.

V = Variable cost per tonne/annum.

The average selling price P is taken as Rs.145000/MT. The Total cost is the cost of production. This is Rs.69,20,810/= Total variable cost for the production of 500 tonnes of product is shown in Annexure E-9.

CONCLUSION:-

The present scheme for the manufacture of camelback and cushion gum comes under the small scale sector. The

small units gives to the entrepreneur profit, independence and satisfaction. To the nation it provides larger employment with less investment, develop entrepreneurship and entrepreneur skills, disperses Industries for wider distribution of wealth, mobilises local resources skills and savings.

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Section-B

ANNEXURE-B1

Description	Unit	Basic price Rs.	Excise duty Rs.	Total price Rs.
1. Tread Rubber Cushion backed packed in tins	kg.	14.00	4.90	18.90
2. Cushion Gum 1/32" x 6" size packed in 1 kg tin.	kg.	26.00	9.10	35.10

Note : Sales tax extra.

SECTION-C

ANNEXURE- II-1

Raw material requirements:-

Material	TREAD		CUSHION GUM	
	Parts/100 rubber	Wt./400 parts	Parts/100 rubber	Wt./100 parts
Natural Rubber	80	190.93	100	67.98
Reclaim Rubber	40	95.46	--	--
Zinc Oxide	4	9.54	4	2.72
Steric acid	2	4.77	1	0.68
HAF black	50	119.33	--	--
FEF black	--	--	30	20.39
Pine tar	6	14.32	8	5.43
Micro wax	1	2.39	--	--
Vulcacite DZ	0.60	1.43	0.60	0.41
Antioxidant BL	1.00	2.38	1.0	0.68
Santeflex IP	0.5	1.19	--	--
Sulphur (soluble)	1.5	3.58	--	--
Sulphur (Insoluble)	1.00	2.38	2.5	1.7
Total	167.60		147.10	

ANNEXURE- II-2.

Raw Material Requirements:-

Material	Price/tonne Rs.	Quantity/yr. (tonnes)	Value Rs.
Natural Rubber	11,000.00	258.91	28,48,000.00
Reclaim Rubber	3,600.00	95.46	34, 3,600.00
Zinc oxide	14,000.00	12.26	1,71,000.00
Stearic acid	15,500.00	5.45	84,400.00
HAF black	15,250.00	119.33	18,19,780.00
FEF black	14,000.00	20.39	2,85,000.00
Pine tar	6,000.00	19.75	1,18,000.00
Micro wax	6,000.00	2.39	14,000.00
Vulcacit DZ	92,500.00	1.84	1,70,200.00
Antioxident BL	55,000.00	3.06	1,68,000.00
Santoflex IP	1,15,000.00	1.19	1,36,000.00
Sulphur (soluble)	3,500.00	3.58	12,500.00
Sulphur (Insoluble)	40,000.00	4.08	1,60,000.00
	Total	527.69	53,30,480.00
Waste (+ 3%)		15.83	1,59,914.00
Total		543.52	54,90,394.00
Rounded off		543	55,00,000.00

ANNEXURE-III-1

Man power Requirements:-

Personnel	Working shift	Labour per day S	S.S.	U.S.	Total per day	Cost per month Rs.
(1) Supervisory Staff:-						
Production	3	3			3	2100.00
Engineering	1	1			1	700.00
Quality Control	1	1			1	700.00
(2) Rubber Technologist	1	1			1	2000.00
(3) Administration Accounts and sales						
Officer	1	1			1	1000.00
Clerk/typist	1	1			1	500.00
Marketing Assistant	1	1			1	800.00
(4) Labourers						
Compounding	2		2	2	4	1300.00
Mixing	3	3	--	3	6	2100.00
Extrusion cum packing	2	2	--	8	10	3200.00
Calander cum packing	2	2	--	4	6	2000.00
Watch & ward	3	-	--	3	3	900.00
Total		16	2	20	38	17300.00

Skilled (S) Rs.400/month.
Supervisor Rs.700/month.
Semiskilled (SS) Rs. 350/month.
Unskilled (U.S.) Rs.300/month

Total salary and wages per month	Rs. 17,300.00
Total salary and wages per annum	Rs.2,07,600.00
Frenge benefits 20%	Rs. 41,520.00
Total per annum	Rs.2,49,120.00
Rounded off	Rs.2,50,000.00

ANNEXURE - IV-1

Land and Building:-

1.	Cost of 2500 sq.m. of land @ Rs.12/sq.m.	-	Rs. 30,000.00
2.	Site levellings, fencing, drainage, road.		Rs. 8,000.00
3.	Cost of 750 sq.meter of built up area @ Rs.450/sq.m.		Rs.3,37,500.00
4.	Over head tank (50,000 litres capacity)		Rs. 40,000.00
			Rs.4,15,500.00

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ANNEXURE- V-1

Plant & Machinery:-

	Description	No.	Price/ item Rs.	Value in Rs.
1.	16" x 42" mixing mill with chilled cast iron rolls, 60 HP/960 RPM electric drive reduction gear etc.	1	2,20,000/-	2,20,000.00
2.	12" x 30" mixing mill with chilled cast iron rolls, 25 HP driving unit	1	1,00,000/-	1,00,000.00
3.	6" x 22" three roll calender with 10 HP motor, reduction gear etc.	1	42,000/=	42,000.00
4.	4½" extruder (variable speed) with 20 HP motor, reduction gear etc.	1	54,000/=	54,000.00
5.	Tread die-head	1	15,000/=	15,000.00
6.	Conveyer for extruder and calander	2	8,000/=	16,000.00
7.	Cooling tank (60' length)	1	15,000/=	15,000.00
8.	Weight scales			
	(a) 100 kg.	2	7,500/=	15,000.00
	(b) 10 kg.	2	3,000/=	6,000.00
9.	Pumps and pipings			20,000.00
10.	Laboratory Equipments			35,000.00
	Total			5,38,000.00
	Provision for price excalation @ 10%			54,000.00
	Sale tax, Fereight foundation, instellation cost etc. @ 15%			80,000.00
	Grand total			6,72,000.00

ANNEXURE-VI-1

Utilities:-

Water:-

Mixing mill	-	5 Kilo litres
Warming mill and calander	-	5 -Do-
Extruder	-	10 -do-
Cooling tank	-	15 -do-
Other uses	-	5 -do-
Total	-	40 Kilo litres

Water required per day = 75 kilo litres

ANNEXURE-VI-2

POWER:-

Item	Power (KW)
1. Mixing mill	45
2. Extruder	15
3. Calander	7.5
4. Water pump	4
5. Conveyers	0.50
6. Lighting, ventillation etc.	5.0
Total	76.00

Electricity (fixed cost)

1. Cabling, light and ventillation installation etc.	Rs. 80,000.00
2. Transformer 125 KVA	Rs. 35,000.00
Total	Rs.1,15,000.00

Electricity (operating cost)

Power consumed per annum KWH	-	5,00,000.
Cost of power/annum @ 0.18 paise/KWH	-	Rs.90,000.00

Section - D

ANNEXURE - D- 1

Raw materials:-

Ingredient	TREAD		CUSHION GUM	
	Formulation	Wt./40 kg. batch	Formulation	Wt./40 kg. batch
Natural rubber	80	19.09	100	27.19
Reclaim Rubber	40	9.54	--	--
Zinc oxide	4.0	0.95	4.0	1.08
Stearic acid	2.0	0.47	1.0	0.27
HAF Black	50.00	11.9	--	--
FEF black	-	-	30	8.15
Pine tar	6	1.43	8	2.17
Micro wax	1	0.23	--	--
Vulcacit DZ	0.6	0.14	0.6	0.16
Antioxidant BL	1.0	0.23	1.0	0.27
Santoflex AW	0.5	0.119	-	-
Sulphur	1	0.23	--	-
Sulphur (Insoluble)	1.5	0.35	2.5	0.67
Total	167.6		147.1	

Section-E

ANNEXURE - E-1

Fixed Capital

		Cost Rs.
1.	Land -	38,000.00
2.	Building -	3,77,500.00
3.	Plant and Machinery -	5,38.000.00
4.	Other fixed assets -	1,46,500.00
5.	Pre-operative expenses -	72,000.00
	Total -	11,72,000.00

ANNEXURE-E-2

Other fixed assets:-

1.	Distribution of power and lighting -	Rs.	1,15,000.00
2.	Office equipments -	Rs.	3,500.00
3.	Furniture -	Rs.	8,000.00
4.	Workshop equipments -	Rs.	20,000.00
		Rs,	1,46,500.00

ANNEXURE-E-3

Pre-operative Expenses:-

1.	Interest and blocl loan: (Rs.10 lakhs @ 12% for 6 months)	Rs.	60,000.00
2.	Establishment -	Rs.	3,500.00
3.	Travelling Expenses -	Rs.	2,500.00
4.	Legal charges -	Rs.	1,500.00
5.	Miscellaneous -	Rs.	2,500.00
6.	Property tax -	Rs.	2,000.00
	Total-	Rs.	72,000.00

ANNEXURE-IV - E-4

Working Capital:

	Item		Cost Rs.
1.	Raw materials	-	61,44,600.00
2.	Salaries and wages	-	2,50,000.00
3.	Utilites	-	90,000.00
4.	Other overheads	-	47,675.00
	Total for annum.	-	63,32,225.00
	Working capital for 2 months		10,55,379.00
	Rounded off		10,56,000.00

ANNEXURE-E-5

Over over heads:-

1.	Repair and maintenance of building @ of 1%	- Rs.	3,775.00
2.	Repair and maintenance of machinery @ 5%	- Rs.	26,900.00
3.	Travelling and advertiseing expenses	- Rs.	2,500.00
4.	Insurance 1% on fixed capital	- Rs.	10,000.00
5.	Stationery, postage and telephone	-Rs.	2,500.00
6.	Miscellaneous	-Rs.	2,000.00
	Total	-Rs.	47,675.00

ANNEXURE - E-6

Annual Gross Profit:-

Sales and Return on Capital employed

Item	Cost Rs.
1. 400 tonnes of camelback @ Rs.19/kg.	- 76,000,00.00
2. 100 tonnes of cushion gun @ Rs.35/kg.	- 35,000,00.00
Total sales	- 111,000,00.00
Less:- Excise Duty	- 38,850,00.00
Net sales	- 72,150,00.00
Less:- Cost of production	- 69,208,10.00
Gross profit per annum	- 294, 190.00
Less: Tax	1,790,02.00
Net profit	1,151,88.00

Rate of Return on capital employed:

$$\frac{115188 \times 100}{2231000} = = 5.16\ \%$$

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ANNEXURE-E-7

Annual cost of production:-

		Cost Rs.
1.	Raw materials	- 61,44,600.00
2.	Salaries & wages	- 2,50,000.00
3.	Utilities	- 90,000.00
4.	Other over heads	- 47,675.00
5.	Interest on working capital loan 16%	- 1,68,960.00
6.	Interest on estimated block loan @ 12%	- 1,20,000.00
7.	Depreciation:	
	a. Building @ 5%	- 18,875.00
	b. Machinery @15%	- 80,700.00
	Total	- 69,20,810.00

ANNEXURE-E-8

Pay back period:- - Cost Rs.

Total Profit(before tax)	-	2,94,190.00
Less:- Tax	-	1,79,002.00
Net profit	-	1,15,188.00
Add depreciation	-	99,575.00
Available surplus	-	2,14,763.00
Payback per annum (Rs.2,14,763 @ 75%)		= 1,61,052.00
Term loan		=10,00,000.00

Payback period = 6 years.

ANNEXURE-E-9

Breakeven analysis:-

1.	Direct labour	- Rs.	1,04,400.00
2.	Direct material	- Rs.	61,44,600.00
3.	Utilities	- Rs.	90,000.00
4.	Selling and distribution cost	- Rs.	4,50,000.00
	Total variable cost	- Rs.	67,89,000.00

Fixed cost = Total cost - Total variable cost

= 1,31,810.00

Variable cost per unit(per tonne) = Rs.13,600.00

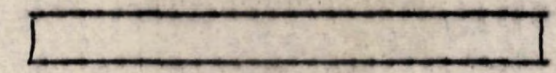
$$BE = \frac{131810}{14500 - 13600}$$

= 146.5 M.T.

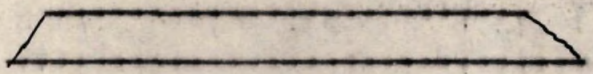
The breakeven production is 146.5 MT/annum.

APPENDIX- I

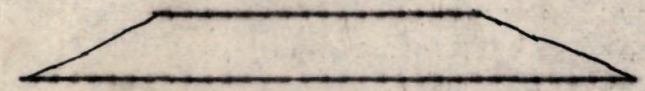
Types of Camel back:-



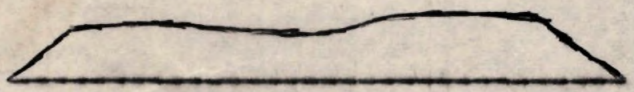
Slab - straight edge



Slab - Bevel stock



Sing stock (Camel back)



Valley type (Double hump)

APPENDIX - II

Camel back size	Tyre size	Vehicle
74 - 78 - 18	11.00 - 20	Truck
74 - 78 - 18	10.00 - 20	Truck
64- 66 - 18	9.00 - 20	Truck
60 - 62 - 18	8.25 - 20	Truck
54 - 56 - 17	7.50 - 20	Medium Truck
50 - 52 - 17	7.00 - 20	Medium Truck
34 - 42 - 10	5.20 - 13	Standard
34 - 42 - 10	5.60 - 13	Herald
40 - 46 - 10	5.90 - 15	Ambassador.
34 - 42 - 10	5.20 - 14	Fiat
54 - 56 - 10	7.00 - 15	Jeep

APPENDIX - III

Machinery Suppliers:-

1. Kelachandra Foundry,
   Chingavanam P.O.,
   Kottyam, Kerala.

2. Sohal Engineering Works,
   Agra Road, Bhandup,
   Bombay - 78 NB

3. Indian Expeller Works,
   A-4, Naroda Industrial Estate,
   Naroda, Ahmedabad.

4. SCA Private Ltd.,
   Mahalaxmi Chamber,
   3rd Floor,
   Bhulabhai Desai Road,
   Bombay.

5. Alappat Industrials,
   Mehhanical & Foundry Engineering,
   Marar Road,
   Trichur - 680001.

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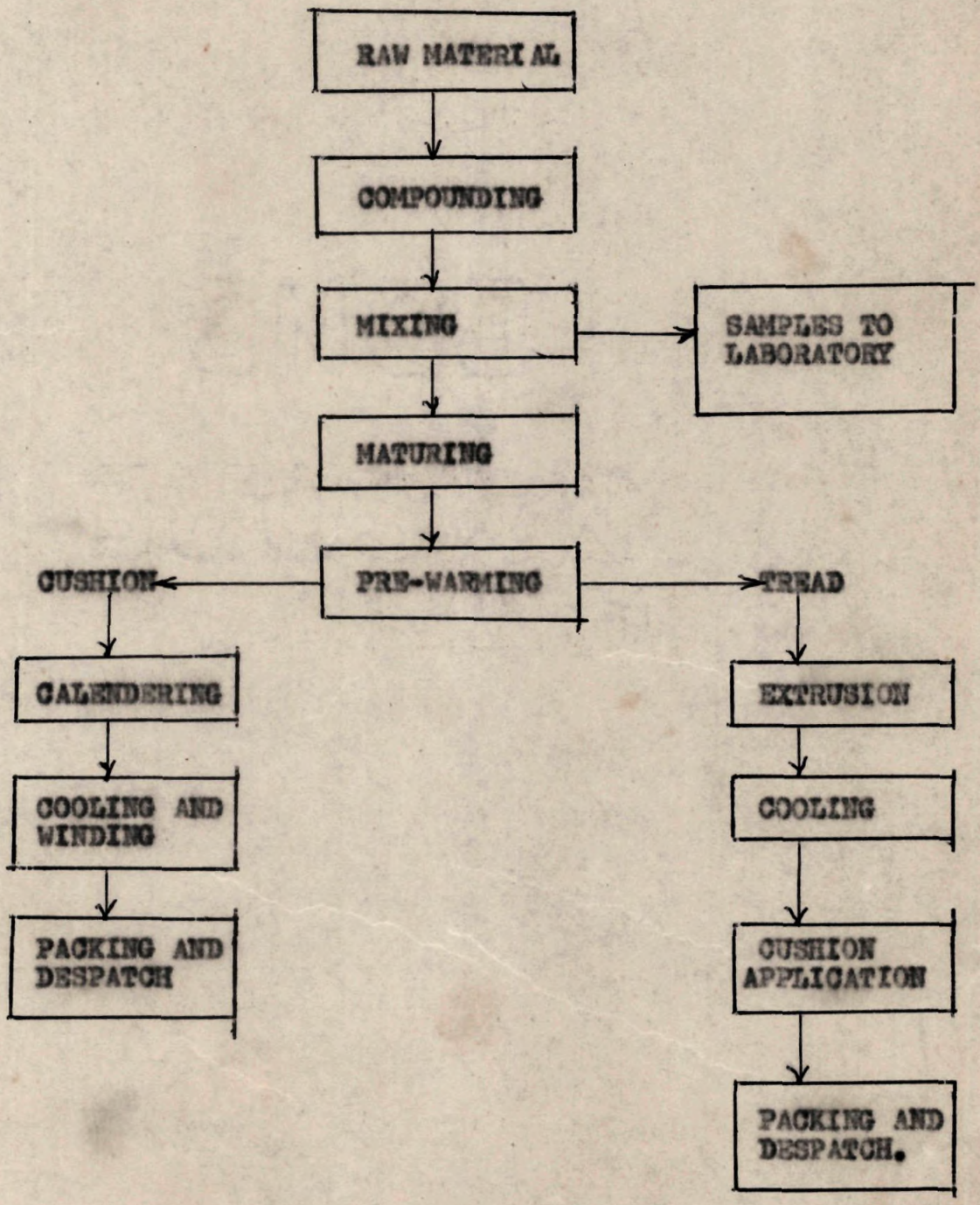
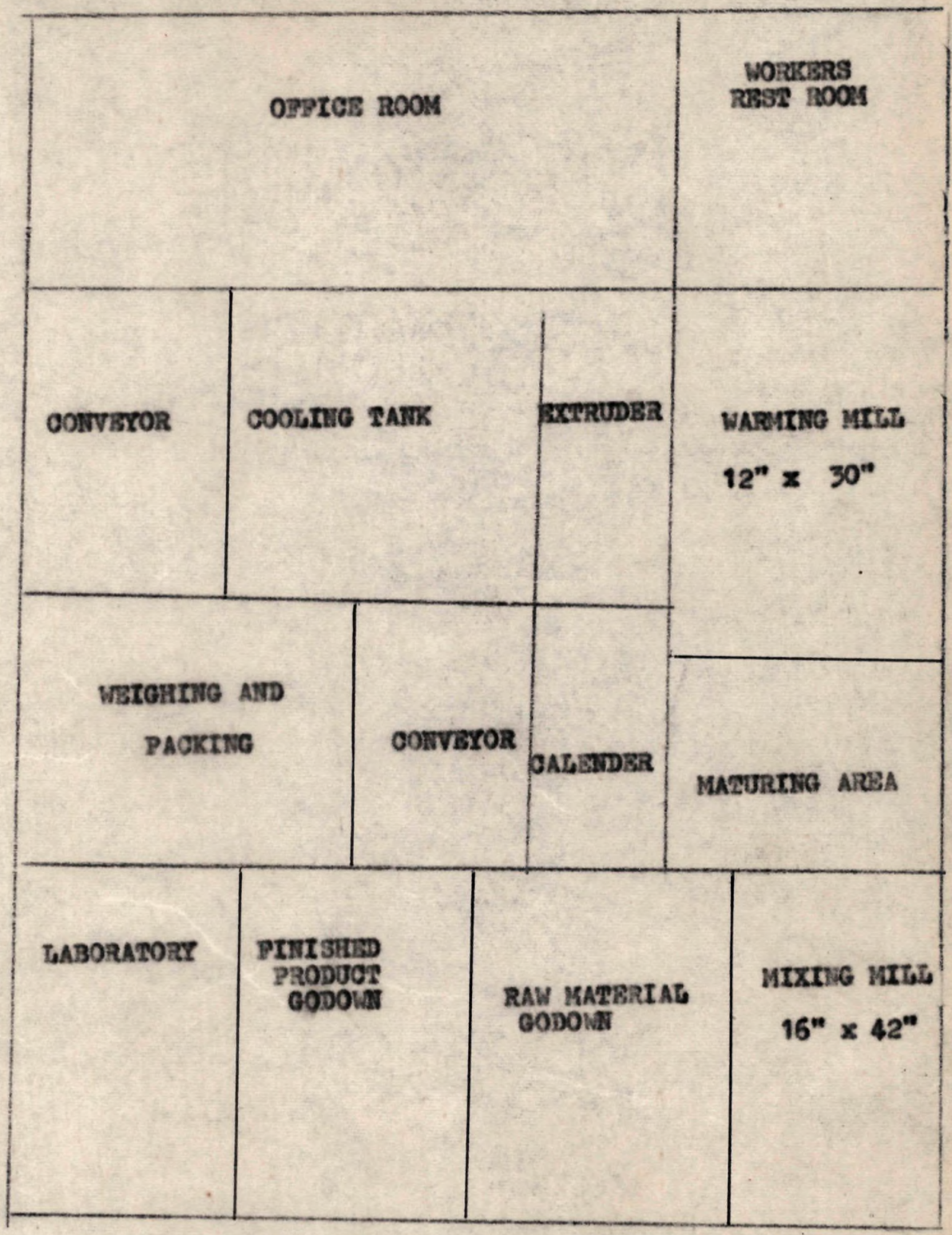
APPENDIX-IV

PROCESS FLOW DIAGRAM



APPENDIX-V

LAY OUT



Land - 2500 sq.meter.
Building- 800 sq.meter.

APPENDIX-VI

Raw material suppliers/Manufecturers:-

1. Natural rubber:- Readily available in the market.
2. Reclaimed rubber:-

   a) Indian Rubber Regenerating Co.Ltd.,
   F 2, Govt. Industrial Estate,
   Wagle Wadi, Thana,
   Maharashtra.

   b) Kerala Rubber and Reclaims,
   M.G.Road,
   Cochin-11, Kerala.

3. Accelerators and Antidegradants:-

   a) Alkali & Chemical Corporation of Indian Ltd.,
   34, Chowringhee Road,
   Calcutta-13.

   b) Bayer (India) Ltd.,
   82, Vir Nariman Road,
   Post Box 1436, Bombay-1.

   c) Mindia Chemicals of India Pvt.Ltd.,
   Wakefield house, 11, Sprott Road,
   Ballard Estate,
   Bombay-400036.

   d) Para Chemicals,
   C/o Kerala Paints Pvt.Ltd.,
   Mahatma Gandhi Road,
   Ernakulam, Cochin-11, Kerala.

4. Carbon Black:-

   a) Philips Carbon Black Ltd.,
   31 Netaji Subhas Road,
   Calcutta-1.

   b) United carbon India Ltd.,
   N.K.M. International House,
   5th floor, 178, Backbay Reclamation,
   Bombay-20.

5. Zinc Oxide:-

   Para Chemicals
   c/o Kerala Paints Ltd.,(P),
   Mahatma Gandhi Road,
   Ernakulam, Cochin-11.

6. Stearic Acid:-

   Bombay Oil Industries P. Ltd.,
   Kanmoor house,
   281/287 Narsi Natha street,
   Bombay - 9.

7. **Pine Tar**

Hill products,
H.O. Kanda,
P.O. Kanda,
Dist. Almora,
U.P.

8. **Insoluble Sulphur:**

Kali Chemie,
Stauffer GMBH,
Hannoever,
U.K.

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