UNIVERSITY OF COCHIN

B.Tech. COURSE IN

RUBBER PROCESSING AND TECHNOLOGY.

PROJECT REPORT

ON

A SMALL SCALE UNIT TO MANUFACTURE AUTOMOBILE RUBBER BUSHES IN KERALA

DISSERTATION

Submitted by

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FORWARD

This project report is prepared and submitted in the form of a dissertation unlike projects to procure loans to start new industries. The primary mission is the partial fullfilment of an academic Technical Degree. Technical aspects and process of manufacture are given. I hope this will serve as a guide line to start and operate the project.

I take this opportunity to express my thanks to all persons who helped in my endeavour and in particular to Mr.C.M.George, Project Officer, Mr.E.V.Thomas, Deputy Director, Mr.M.K.Balagopalan Nair, Chemical Engineer and Mr. P.U.George, Cost Accountant of Rubber Board and Rubber Research Institute of India.

Kottayam - 9,
15th March 1977.

P.J.ANTONY.

PROJECT IN A NUTSHELL.

(1)	Fixed Capital	Rs. 246340
(2)	Working Capital	Rs. 102550
(3)	Total capital	Rs. 348890
(4)	Plant and Machinery	Rs. 218440
(5)	Location -	Industrial Estate in Kerala.
(6)	Labour force -	22
(7)	Staff -	4
(8)	Annual production -	30000 Kg./Annum.

SECTION - A

I N T R O D U C T I O N

General

Application of rubber in vehicles start from the beginning of automobile industry. Apart from tyres and its components, a modern car has over 200 to 300 rubber parts weighing 20-30 kgs. The moulded items include (1) Bushes, (2) Oil seals and O-rings (3) Mattings. Engine mountings, and so on. Two types of bushes are available. One type is metal bonded and the other not bonded. Rubber bushes find vast application in passenger cars.

The suspension system is one of the most interesting features of new vehicle and provides the Key to its versatility. Helical springs have been adopted to for the basis of the suspension system as these permit wide range of axle movement. A detailed inspection of most modern vehicles reveals the marked trend towards increased employment of rubber in suspension systems and engine mountings. Important application of rubber for vibration and noice insulation in the motor car namely

a) between engine and chassis

b) between chassis and body.

c) between springs and chassis

d) between axle and chassis ie. for suspension purpose.

The rubber bushes are advantageous over metal bushes in respect of cost, maintenance and noice. The basis function of bushes comprises the following:-

(1) Absorbing shock

(2) Avoid noice.

(3) Avoid wear and tear by metal to metal contact.

(4) Give riding confort.

(5) For insultation purpose ie to avoid electrical pathways.

(6) For sealing purpose.

OBJECT OF THE PROJECT

This is a scheme for producing automobile rubber bushes according to following production schedule

Ambassador bushes - 30 kgs/shift.

Other bushes - 20 kgs/shift.

Product Description

Main object of this project is the manufacture of Ambassador car bushes. A detailed description of the components are 57 items falling in to 11 types. These are classified according to the position in which they are put to use.

(1) Bush Eye Bolt to arm - bush rubber used in the eye bolt to arm. 4 numbers.

(2) Bush rubber used for mounting the gear box - one number.

(3) Bush rubber in the tie rods which connects the suspension to body. Four numbers.

(4) Bush rubber in the upper link. Four numbers.

(5) Bush rubber arm to bracket. Eight numbers.

(6) Bush shock absorber upper. Twelve numbers.

(7) Bush shock absorber lower. Four numbers.

(8) Seal rubber lower link - 8 numbers

(9) Seal rubber upper link - 2 numbers

(10) Seal Dust - 4 numbers

(11) Bush seal spring pins - 12 numbers.

Total weight is approximatly 750 grams. The weight can very depending upon the type compounding, fillers used, loading etc.

Hardness varies according to requirement. Usually lies between 60-65 IRHD. All the above parts are not bushes. Some are dust seals. Natufal and synthetic rubber can be used for the manufacture of the product depending on service requirements., Tensile strength, Elongation at break, Tension set, compression set, ageing resistance, Volume change after immersin in oils, etc. are important parameters to be noted for determining the serviceability of the bush compound. For defense vehicles, which carry sophisticated electronic equipments, bushes of specified electrical resistivity are required. Low temperature perfomance and flex resistance must be high depending on operating conditions.

Prospects and importance of the product to Country.

Generally the rubber bushes are used in vehicle suspension spring and shock absorber pivots. They are advantageous over metal bushes in cost durability and replacement. The main field of application is limited to passenger vehicles. For heavy duty vehicles rubber bushes are facing severe competition from metalic bushes.

The demand for rubber bushes can be assessed from the following fractors.

(1) Replacement frequency of bushes.

(2) Vehicle production and stock of venicles.

(3) Petrol consumption.

Replacement frequency of bushes.

The average service life of a bush lies between 15000 - 20000 kilometers depending on road conditions and quality of product. A taxi car covers 30000 kilometers a year, considering 100 kilometers a day. One car replaces its rubber bushes three time in two years. Ambassador car shows the maximum replacement.

TABLE-I

Stock of Vehicles (Round of figures)

Year	Cars	Jeeps
1961	70000	20000
1962	90000	25000
1963	104000	30000
1964	125000	36000
1965	145000	42000
1966	170000	49000
1967	200000	58000
1968	230000	61000
1969	262000	65000
1970	300000	70000
1971	330000	74000
1972	360000	80000
1973	390000	86000
1974	420000	90000
1975	445000	95000

Source: All India Automobile Association.

Above statistics show tremendous growth of automobile industry. Commercial vehicles and three wheeles also showed same trend.

Automobile industry, which is the sole consumer of bushes will show rapid growth in comming years as well. So a small seal unit xxx of 30000 kgs can sell its product easily.

TABLE-II

PRODUCTION TARGET TILL THE END OF FIFTH PLAN

Industry	76-77	77-78	78-79
Cars	51000	55000	60000
Jeeps	16000	17000	18000
Autorickshaws	24000	31000	40000
Commercial Vehicles	66000	78000	92000

TABLE-III

Consumption of Petroleum Products (1000 Tons)

1971	1972	1973	1974	1975	Years
20640	22628	23687	23015	23345	Petroleum Products

Consumption figures of petroleum products, which is related with vehicle mobility show signs of escape from petrol price hike. Discovery and commercial production of oil at Bombay high, dieselisation of passenger vehicles are other prospective developments.

Considering the above factors there is ample scope for starting a new unit for production of 30000 kgs. of automobile bushes.

SECTION - B

M A R K E T S U R V E Y

CUSTOMER.

Rubber bushes constitutes a major item of light vehicles especially of passenger cars. Which serve the purpose of avoiding metal to metal contact in major assemblies reducing the wear and tear are considered, the market is widespread.

(1) Replacement market. Since the replacement frequency of rubber bushes are high, the major consumers are vehicle owners.

(2) Original equipment Manufacturers. Automobile manufacturers buy rubber parts from small scale with provided they can make good quality products to meet their specification.

Present production.

No specific statistics regarding production of rubber bushes are available units manufacutring automobile rubber parts comes to about 700.

Availability and classification.

Bushes are available in innuberous shape, size and design depending on model and type of vehicle, position in which it is put to use, specially designed bushes are required for Ambassador, Fiet, Standard, Jeeps and other vehicles.

Pricing Policy.

Bushes are available in market in two forms, Bush Kits in which the complete set of bushes required for a vehicle are packed together. Price is quoted for a complete set. In other cases the bushes are grouped in to different types and price quoted for a dozen. Average price per kg. vary, from Rs.25 to 35 from company to company.

Channels of Distribution.

Rubber bushes are distributed through shops dealing with auto parts.

Effect of change of quality.

Consumers are more interested on quality than price. They showed special interest on some trade names due to quality assurance. A market survey conducted at Kottayam revealed that food quality product can enjoy a sellers market.

Export Market.

Export statistics of rubber bushes are not available. Good quality product can enjoy export market.

SECTION - C

PROCESS OF MANUFACTURE

The separate processing steps on the manufacturing operation are individually discussed below. The principal steps are

1) Compounding
2) Mixing, maturing, warming.
3) Bank preparation and Moulding
4) Inspection, Finishing, Packing and despatch.

1) Coundings: Compounding

The rubber and ingredients are wighed out as per the predetermined formula and teach weight. Thes choice of rubber and compounding ingredients depends upon the follwing.

1) Vuleanisate properties
2) Price
3) Processability.

The service performance demanded on the product by consumer determines the vulganisate properties and is obtained from mafket survey. An outline of the principles adopted in arriving at suitable formulation to produce bushes of specified service perormance in both the vuleanised and unvaleanised state, are given below

1) Specified Hardness.
2) Sufficient Mechanical strength
3) Compression set resistance
4) Shrinkage
5) Mouldability.

6) Resilience

7) Scorch safty

8) Flex resistance.

The best compramise polymer is natural rubber. Hardness range from 60-65 IRHD. GPF Black is used. The compound is cheapened by china clay loading.

2 Mastication and mixing.

Natural rubber should be masticated before mixing. When the nerve disappears, other ingredients are added. Mastication takes 4-6 minutes.

After mastication, the ingredients which are weighed according to predetermined formula and teach size, are added in sequence. The cooling water is passed thrwgh the mill to prevent over heating which could result scorching. Batch size and order of addition is shown in Annexure II. For a 12" x 30" mill batch between 20-30 minutes depending upon type of mix. First masticate the rubber alone with peptisers, if necessary, followed by addition of antioxidant, activators, fillers, process oils and accebrators. Sulpher is added just before removal from mill.

Maturing: The maturing time is usually 24 hours. Maturing is carried out to get unorm disperson of black, fillers, other ingradients and reduce variation from batch to batch and within each batch.

Prewarming:

After 24 hours maturing, the stock is prewarmed on the same mill untill the compound regains its plasticity. Proper uniform warming makes stock preparation easy and reduce grain effect. The warming time usually given is 5 minutes. Sulpher may be added during this prewarming.

Blank preparation: Prewarmed stock is taken and Blanks of appropriate size and shape as that of individual bush cavities is correctly filled and so wastage due to over-flow or rejects due to underfilling of the mould are avoided. Blanks are kept in clean places.

3 Moulding And Vulcanisation:

Moulding is the operation of shaping and vucanising the plastic rubber compound by means of heat and pressure in a mould of appropriate form. Fundamentally all process of moulding are similar. Depending on the ways of introducing the material into the cavity there are

(1) Compression moulding.

(2) Transfer moulding.

(3) Injection moulding.

Selection of method depends on (1) quantity of production (2) Shape of product (3) Capital investment.

In this project compression moulding is adopted.

Moulds: Steel moulds, suitably hardened and finished with channels and spew grooves to accommodate the excess compound are used. Moulds of two three or more pieces are available.

Moulding operation: The mould surface cleaned and mould releasing agent applied. Releasing agents include silicone emulsion, soaps detergents etc. mould dried and heated to ~~&xm~~ required curing temperature. Mould opened and the blanks are placed in mould activity, then closed. During cure pressure of the level 75-150 kg/cm^2 applied. After 6 minutes, the press opened, mould taken out and cured pices taken for deflashing.

4 Deflashing: Deflashing can be done by different methods (1) Hand trimming. (2) Mechanical deflashing using liquid carbon dioxide.

For small items mechanical deflashing is easy. In this project hand trimming is followed to save additional capital expenditure.

Inspection and Finishing: The product is inspected for Air markings, surface shyness, Air Trapping, porosity, Distortion, flow cracks, Torn edge, Rough surface etc and those found defective are removed as scraps.

Packing: Packing is done in cardboard boxes. Manufactures name trade name, product description, date of manufacture are given on the packet.

Process Loss: This being a moulded item, losses during manufacture are high. The losses vary from 10-10%. The losses are accounted by

(a) Handling losses: This include fly losses during transportation, handling, weighing and compounding.

(b) During Mixing: Carbon black and other powders fly during mixing.

(c) Stock preparation and cutting loses.

(d) Scorched compounds.

(e) Mould flashes.

(f) Scraps.

QUALITY CONTROL.

Every product should have a certain level of quality. Worth of its price. Rubber bushes are available at different quality levels. Cost and quality are interdependent quality control should be from the very start of purchase of raw materials to the final despatch of finished product.

Tests done on raw materials are

(1) Polymer. Visual inspection for dirt, dryness, contaminants bubbles.

(2) Fillers are tested for grit content and purity.

(3) Accelerators, anti degradents, stearic acid.

Random samples selected from each lot and tested for melting point, solubility in suitable solvents.

Inprocess quality control: Following tests are proposed.

(1) Specific gravity. Specific gravity of each batch is tested after press ~~x~~ curing small strip samples. If it conforms to compound specific gravity, the compound can be passed.

(2) Hardness: Hardness of the above strip is measured to ensure proper addition of fillers. If the results are within specified tolence it is passed.

Product Testing: Finished goods are tested for Hardness and specific gravity. Hardness tested using durometer.

WASTE DISPOSAL:

The smin losses are occuring during moulding. These waste material can be reworked. They are sold for reclaiming.

PRODUCT DIVERSIFICATION.

The extra time available with mixing mill and presses can be used for manufacutre of O-rings, oil seals, rail pads, Kitchen ring and other moulded items.

SECTION - D

PRODUCTION REQUIREMENTS

LOCATION

The basic consideration in the selection of location of any industrial undertaking are

(1) A factory is relatively ~~xx~~ immobile.

(2) The impact of location in operating costs may vary up to 25 to 50%. For a automobile bush manufacturing factory, the important considerations to be given are.

(1) Power availability.

(2) Water availability.

(3) Facilities for transportation of raw and finished goods.

(4) Availability of raw materials.

(5) Proximity to market and labour availability.

As the rubber bushes are consumed in all parts of the country, the factory can be located in Kerala where raw materials are available in plenty. Power water and skilled labour are available in plenty. The factory can be located in a backward districts of Keral So that incentives provided by the Government can be enjoyed.

This small scale industry for producing automobile bushes can be conveniently located in an industrial estate due to following reasons.

(1) Lower capital investment. Land building are available at nominal rent.

(2) Electricity, water and transport facilities are available without delay.

(3) Reduce overhead cost to minimum.

(4) Availability of labour in the grade and quantity required.

(5) Industrial estate provide accommodation for banks, shops, canteen etc.

(6) Availability of testing facilities.

LAND AND BUILDING

A plant area of 2000 sq.feet is sufficient for this project. Annual rent on this building comes to Rs.5000/-.

For finalising the build up area required for each machinary thefactors considered are:-

(1) Minimum build up area required for each machinary.

(2) Layout plan to be adopted.

(3) Expansion programme in coming years.

(4) Space for keeping improcess inventory.

Based on above considerations, the following areas are adopted for specified machinary.

(1) Raw Material storage	- 250	Sq.feet.
(2) Weighing, Compounding	- 140	"
(3) Mill room + Maturing	- 300	"
(4) Presses Four numbers	- 450	"
(5) Deflashing	- 210	"
(6) Inspection, Packing	- 250	"
(7) Office, Toilet	- 400	"
Total	- 2000	"

Single storied, 66 x 31 feet building is prefered one. A typical layout is shown in Appensix-2.

SECTION - E

MATERIAL REQUIRMENTS

The total estimated production for 2 shifts working per /day/ annum including process losses is 30000 kgs. The break of this production under various products are

(1) Ambassador bushes - 24000 Kits

(2) Other bushes - 12000 kgs.

For the above estimated production, total requirements of all types of raw materials based on selected formulation are given in ANNEXURE-I.

The important classes of raw materials are listed below:-

Pâlymer: The estimated production requires 15110 kgs of natural rubber. Natural rubber is available from local market at rate of Rs.6.5/kg. Available in sheet, creep and solid block forms.

Fillers: China Clay and GPF are the fitters used. Quantity required are

China Clay	-	6044 kg.
GPF black	-	9066 kg.

Process Aids: Aromatic oil is used inthis formulations 1511 kgs required.

Accelerator System: The accelerators required are MBTS, TMT.

ZnO - Stearic Acid activation is given.

Annual consumption and price of these items are given in Annexure:

PBN is used as antidegradent.

Terms of Purchase: All negotiations related to purchase of raw materials are done through banks. On a margin money of 30%, the bank will advance 70% for the purchase of materials. The amount has to be paid back from sales within 70 days with interest. The purchased materials will be kept in banks godown in the factory and the materials are withdrawn on payment of cash.

MACHINARY.

The machinary size, capacity and number are primarily determined by the production capacity. The machinary required for production are given below

(1) Mixing Mill: Size 12" x 30" Mill complete with cast iron rolls, reduction gear, 30 HP motor, starter with electromagnetic break, safty device and other accessories.

The batch weight is 15 Kilograms. The cycle time required for mising is 30-35 minutes. Assuming a 8 minutes warming time,

8 batches can be mixed per shift.

Presses

For this project four presses are required. One three daylight hydraulic press and three hand presses. Electrical heating is done. For small artics moulding in hand presses are sufficient. One advantage with hand press is reduced capital expenditure.

Moulds.

MS moulds are used available from local manufactures on order.

Terms of purchase of Machinary.

(1) Quotations are called for and satisfactory quotations are conformed.

(ii) Price quoted are exclusive of packing, transportation costs, sale tax, excise duty etc.

(iii) 30% of the price should be paid in advance and remaining at the time of purchase.

(iv) Purchaser has the right for inspecting machinary.

(v) Supplier posses the right for cancellation, changing delivery time and price due to unforeseen reasons.

(vi) Warranty against manufacturing defects assured.

(vii) Liabilities passes on to customer immediately after despatch and shortages should be notified within one week.

SECTION - F

MAN POWER REQUIREMENTS.

The total man power requirements are classified under following heads.

(1) Administrative Staff.

(2) Labours.

Administrative Staff.

The administrative staff is headed by manager cum technologist. One accountant, one salesman and a peon constitutes the department.

Labours Requirement

The labours arethe people involved in the actual production operation. Details of distribution of labours for various jobs are given

MAN POWER REQUIREMENT

A. Staff Requirement

Job Description	Total Staff per shift.	Number of shifts	Staff per day
1) Manager cum technologist	1	1	1
2) Accountant Typist	1	1	1
3) Salesman	1	1	1
4) Peon	1	1	1

B. Labour Requirement

	Skilled	Unskilled	Number of shifts	Total Labours
(1) Production Supervisor	-	-	2	2
(2) Compounding/ Weighing	-	1	1	1
(3) Mixing	1	1	1	2
(4) Blank preparation	-	1	2	2
(5) Press operators	2	2	2	8
(6) Deflashing	-	3	2	6
(7) Packing	-	1	1	1

DETAILS ARE SHOWING IN ANNEXURE - 8

SECTION - G

CAPITAL REQUIREMENTS

The financial aspect of the unit can be given under the following five heads.

(1) Fixed capital Requirement

(2) Working Capital Requirement

(3) Gross capital Requirement

(4) Total manufacturing Cost.

(5) Sales and sales administration expense.

1) Fixed capital: It is the sum ofthe expenses incurred for plant manichinary and pre-operative expenses that can bee capitalised. Pre-operative expenses are accounted for the costs incurred during the idle time of plant and machinary before regular Production starts. The estimated fixed capital reguirement is as follows:

(1)	Plant and Machinary	Rs.218440
(2)	Pre operative expenses	Rs. 16880
(3)	Miscellaneous Fixed Costs.	Rs. 22000
	Total	Rs.257320

Detailes of fixed capital are shown in ANNEXURE -

2) Working Capital:

Working capital requirement depends on

(1) Direct material Inventory. In this project three months material inventory is sufficient.

(2) The Duration voheed in manufacturing, marketing and selling.

(3) The Duration for which finished goods should be stocked to ensure uninterupted supply to market.

(4) The duration between selling goods and collecting payments.

The Costs involved during the intervel is called working capital.

For this project 3 months working capital is sufficient and is given as follows:-

(1)	Raw materials, cost of purchase transportation etc.	-	216340.00 216390.00
(2)	Manufacturing costs.(a) Salaries	-	143300.00
(2)	and wages (including 20% benefit)		
	(b) Cost of utilities (Water, electricity)	-	25523.00
(3)	Rent on building	-	5000.00
(4)	Other overheads	-	30000.00
	Working capital for one year (Round of Rs. 420060/-)		419163.00

Working capital for three months Rs.105000/- 102550

Details of working capital components are given in Annexure-

3) Gross Capital Requirement.

It is the sum of fixed capital investment and working capital requirement and is the total capital investment in this scheme. Details are given as

Total Fixed	- 215340	246340
Working capital	- 102550	102550
	320340	348890
	317890	

4) Total Manufacturing Cost.

The annual manufacturing expenses incurred for the production of 30000 kg of bushes are given in following heads.

(1) Raw materials.

(2) Consumable store

(3) Utilities.

(4) Direct personel costs (1) Direct supervising staff.
(2) Direct Labour.

(5) Plant over heads	(i) Lighting Ventilation etc. (ii) Maintenance and Repair. (iii) Indirect personal.
(6) Fixed charges	(1) Factory Depreciation. (2) Insurance. (3) Capital Taxes.

SECTION - H

U T I L I T I E S

Utilities include power, water, steam etc.

WATER REQUIREMENTS.	For two shifts
Water for Mixing Mill	6000 litres
Toilet and other purpose	1000 "
Total	7000
Rupees per year	693
Total power required per day for presses, Mixing Mill, and lighting Purpose	568 K.WH.
Total charge at rate of 15ps/Unit/year	Rs.24560/-
Total Utilities	25253.

Details are shown in ANNEXURE.

SALES AND SALES ADMINISTRATION EXPENSES:

These are broken down into following heads.

(1) Marketing Distribution and frieght expenses.

(2) Sales Administration expenses.

Details are shown in Annexure.

SECTION - I

F I N A N C I N G P L A N.

The financing requirements of any industry are very high and an entre-premier cannot meet by himself all the expenses. Financing agencies for helping small scale enterpremier are

1) State Financial Corporation.

Loans of upto 10 lakhs for a period of 12 years can be obtained from this institutions. They provide 100% of machinary cost, 75% building cost, and 40% of working capital at 7-10 % interest.

2) Kerala state employment promotion Corporation.

They provide 95% of the cost involved in the purchasing, servicing, Taxes, insurance, and transportation of all machinary and equipment as a loan on interest of 7%.

3) Kerala State Small Industries Corporation.

Machinary worth upto Rs.10 lakhs can be obtained on a Hire purchase scheme on marginal money deposit of 20% (10% technically qualified personal) at 7.5% interest. Repayment starts after two years and should be complete within 7 years.

4) Nationalised Banks.

They providem entire working capital at 16% interest and loans for machinary on 25% margin money at 12% interest.

Other Institutions are National Small Industries Corporation, Industrial Development Bank of India, Unit Trust of Indicate.

Financing Plan of the Firm:

The entire machinary costs are proposed to be taken as loan from Kerala Financial Corporation. The entire working capital is to be taken from Nationalised Banks.

1) K.F.C. - Loan at 7.5% interest	Rs.183500.00
2) Nationalised Bank	Rs.102550.00
3) Own capital	Rs. 62980.00
Total	Rs.349030.00

Own Capital

The balance of the total capital is contributed by the entrepreneur. This is 62880Rs. This amount of fixed capital is used for priliminary and pprecoperative expense.

Borrowings.

1) KFC Machinary cost		Rs.183500.00
2) Nationalised Banks		Rs.102550.00
	Total	Rs.286050.00

PRODUCT PRICING

Product price is fixed based on current mafket price, cost of production, productionm capacity, profit consideration, sales commission, sale tax, excise duty and other ~~xxxx~~ considerations. For Ambassador Bush Kt the price is fixed as Rs.20 and others Rs.25/ per Kg.

~~SELLINGxxND~~

SECTION - J

SELLING AND DISTRIBUTION

Selling and distribution can be accomplished through sales agents who are already in the line. Sales commission given is usually 20% of sales turnover. Automobile manufacutures like Hindustan Motors, Standard Motor Company etc are getting rubber parts from small scale units on contract basis. It is possible to enter long term contract with automobile manufacturers.

SECTION - K

PROFITABILITY ANAEYSIS

INCOME AND PROFIT

ANNUAL SALES TURNOVER		Rs.Ps.
1) Sales. (a)	24000 Ambassoder Bush Kits at Rs.20/- each	480000.00
(b)	12000 Kgs. of bushes at Rs.25/- per Kgs.	300000.00
(c)	Return from sales of 3000 kgs. of Scraps at ~~Rs/xxperxkgx~~ Rs.0.50Ps. per kg.	1500.00
	Total sales return	781500.00

SALES AND SALES ADMINISTRATION EXPENSES	
1) Sales commission at rate of 20% on sales return	156300.00
2) Annual Frieight, Distribution and sales expenses 2.5%	19540.00
3) Packing expenses 30Ps per kg.	9000.00
4) Other sales expenses	5000.00
Total	189840.00

Profit

Total sales turnover	781500.00
Less: Sales and Administration expense	189840.00
	591660.00
Less cost of Production (Annexure)	465700.00
Profit for taxation	125960.00
Return on gross capital employed 30%	

Profitability

Profit before taxation	125960.00
Less 50% tax on profit	62980.00
Net Profit	62980.00
Rate of return on own capital 100.03%	

Percentage profit on sales turnover 8.8%

SECTION - L

ECONOMIC VIABILITY

(1) Interest Commitments:

	Rs.Ps
a) 7.5% interest on block loan from KFC	13902.50
b) 16% interest on working capital loan from Commercial Banks.	16368.00
Total interest commitments	30270.50

ABILITY TO PAY BACK.

The term loan has to be paid back with the prescribed time. Considerable amount on interest can be saved if the term loan is paid by quickly. Of the total profit approximatly 25% is widraw and 75% used to pay back term loan. Since part of the money is paid back in the first year, the ability to pay back borrowings will be more.

Pay back period

a) Annual profit	62980.00
Add Depreciation on (i) Machinary	27525.00
(ii) Other fixed Assets	2790.00
Available surplus	93295.00
Less: Drawings 25% of available surplus	23325.00
Amount used for repayment	69970.00
Term loan to be paid back	183500.00

Pay back period 3 years.

BREAK EVEN ANALYSIS

A.	Total cost of production (Annexure)	465700.00
	Adding sales expenses 20% Commission.	156300.00
	2) Frieght distribution charges (2.5%)	19540.00

	Rs.Ps
3) Packing expenses	9000.00
4) Other sales expenses	5000.00
Grand Total	655540.00

B. Variable cost.

Raw material	216390.00
Utilities	25523.00
Direct labour	114480.00
Sales expenses Commission	156300.00
Frieght, distribution charges	19540.00
Packing charges	9000.00
Total	541233.00

Fixed cost A - B = 114307.

Break even = $\frac{F}{P-V}$ where F = Annual Fixed cost.

P = Price for kg, V = Variable cost per kg.

Break even is 16173 kgs. ie 54.1%

Social benefits

This small scale unit for the mamufacture of rubber bushes provide the following benefits to the nation and to the etrepreneur.

To the entre preneur (1) It gives profit. 2) Satisfaction.

To Nation

(1) Large employment with minimum investment.

(2) Increase revenue earnings of nation

(3) Technical developments.

(4) Adds to industrial development.

(5) Produces good quality automobile ancillary parts.

ANNEXURE - 1

Typical Formulation Based on 15 Kg Batch.

Item.	Weight per Batch Kg.
1) Natural Rubber R.M.A-3	6.8
2) Zinc Oxide	0.2720
3) Stearic Acid	0.1360
4) GPF Black	4.08
5) Process oil	0.68
6) China clay	2.72
7) Ethylene glycol	0.034
8) MBTS	0.068
9) TMT	0.0136
10) PBN	0.068
11) Sulphur	0.138
Total	15.00

ANNEXURE - II

RAW MATERIAL REQUIREMENT.

No.	Item	Parts	Price/Kg. Rs.Ps.	Annual Consumption Kg.	Annual Cost Rs.Ps.
1)	Natural Rubber RMA-3	100	7.50	15110.	113325.00
2)	Zinc Oxide	4	18.00	604.4	10879.00
3)	Stearic Acid	2	15.00	302.2	4533.00
4)	GPF black	60	4.50	9066.0	40797.00
5)	Process oil	10	10.00	1511.0	15110.00
6)	China clay	40	0.40	6044.0	2417.60
7)	Ethylene glycol	0.5	30.00	75.55	2266.50
8)	MBTS	1.0	30.00	151.1	4533.00
9)	TMT	0.15	30.00	22.66	699.80
10)	PBN	1.0	40.00	151.1	6044.00
11)	Sulphur	2.0	2.50	302.2	755.50
	Total	220.65			201326.80
(1)	Transportation and buying expenses Rs.150/Ton.				4995.00
(2)	Allowance for price escallation 5%				10066.30
	Grand Total				216388.10

Round of Rs.216390

ANNEXURE - III.

PLANT AND MACHINERY.

No.	Item	Price/Item	Number	Total Cost
1)	Mixing Mill. 12"x30" mill, 30HP Motor, Reduction gear	80000	1	80000
2)	Presses			
	(1) Hydraulic press 24"x24"x3D, 60Ton Capacity.	60000	1	60000
	(2) Hand fly press 18"x18"	4000	1	4000
	16"x16"	3500	2	7000
3)	Moulds	—	Lot	20000
4)	Buffing Machine	2000	1	2000
5)	Weighing Balance			
	(1) 50kg.	2000	1	2000
	(2) Pantype Balance	500	1	500
6)	Table, Rack, Bins,	3000	Lot	3000
7)	Tools, Cutting Kinef, Scissors	2000	Lot	2000
8)	Hardness tester, specific gravity testing	1000	1	1000
9)	Mould handling equipments	2000	1	2000

Total	183500
Provision for price excalation (a) 5%	9175
Sale Tax and other taxes (a) 7½%	13762.5 0
Freight upto factor site	5000
Foundation and installation charges	5000
Salary and TA etc. of Technical personnel	2000
	218437.50
Round of Rs.218440	

ANNEXURE - 4.

OTHER FIXED ASSETS

(a) Distribution of power and lighting (Electrical installation, cabling)	Rs. 2000
(b) Equipment for supply and distribution of water	2000
(c) Workshop equipments	2000
(d) Misc tools and equipments	1000
(e) Fire fighting equipments	1000
(f) Instruments, meters	1000
(g) Office furniture, table chair	2000
(h) Typewriter, etc.	3000
	14000

ANNEXURE - 5.

PRE-OPERATIVE EXPENSES (6 months to be capitalised)

(a) Interest on block loan (7.5% for 6 months)	6881
(b) Rent, Rates, Taxes	1000
(c) Travelling expense	2000
(d) Legal Charges	1000
(e) Postage, telegram, telephone	500
(f) Printing, Stationary, Advertisement	1000
(g) MISC. Expense	500
(h) Insurance during construction	1000
	13881

Round of Rs.13900

ANNEXURE - 6.

OTHER OVERHEADS

(a) Repairs and Maintenance of Machinery @ 5%	9000
(b) Travelling expense	1000
(c) Insurance 2% on fixed	4370
(d) Rent, rates, taxes	1000
(e) Audit fee	1000
(f) Legal charges	1000
(g) Stationary and supplies	1500
(h) Postage, Telephone and Miscellaneous	1130
	20000

ANNEXURE - 7.

DETAILS OF COST OF PRODUCTION

UTILITIES

A. Power Requirements		HP	K.W./ Two shift
(1) Total Horse Power Mixing Mill		30	
Pump HP		4	
Total		34	249.1
(2) 24" x 24" 3D Press Number of heater/laten	4		
Wattage/heater	1000		179.2
(3) 18" x 18" hand fly Single Daylight press Number of heaters/Platen	3		
Wattage/heater	750		50.41
(4) 16" x 16" Press Number of heater/platen	3		
Wattage/heater	650		87.36
Number of press	2		
Total			566.07

	566.07
(5) Fan, light and other	2.
Total	568.07

Total charge at the rate of 15 Ps. per unit per year 24560Rs.

B. WATER REQUIRMENTS.

	Ltrs.
(1) Water required for mixing mill	6000
(2) Toilet and other purpose	1000
Total	7000

Rs. per year 693Rs.

Total utility expense A + B = 25253Rs.

ANNEXEURE - 8

PERSONNEL COST.

Administration	Rate/month	Annual
Managemem/Technologist	1000	12000
Salesman	500	6000
Accountant/Typist	500	6000
Peon	200	2400
Total		26400
Production		
1) Wages paid to 5 skilled	450	27000
2) Wages paidto 15 unskilled	300	54000
3) Production Supervisor 2	500	12000
Total		93000
Total direct + Indirect salaries		119400
Adding 20% benefits		23880
Total		143280

Round of Rs.143300/-

ANNEXURE - 9

WORKING CAPITAL REQUIREMENTS

(1)	Raw materials (Details given)	Rs.216390
(2)	Salaries and Wages -do-	Rs.143300
(3)	Utilities -do-	Rs. 25523
(4)	Other over heads -do-	Rs. 20000
(5)	Rent on building	Rs. 5000
	Total	Rs.410213

Working capital for 3 months Rs.102550/-.

ANNEXURE - 10

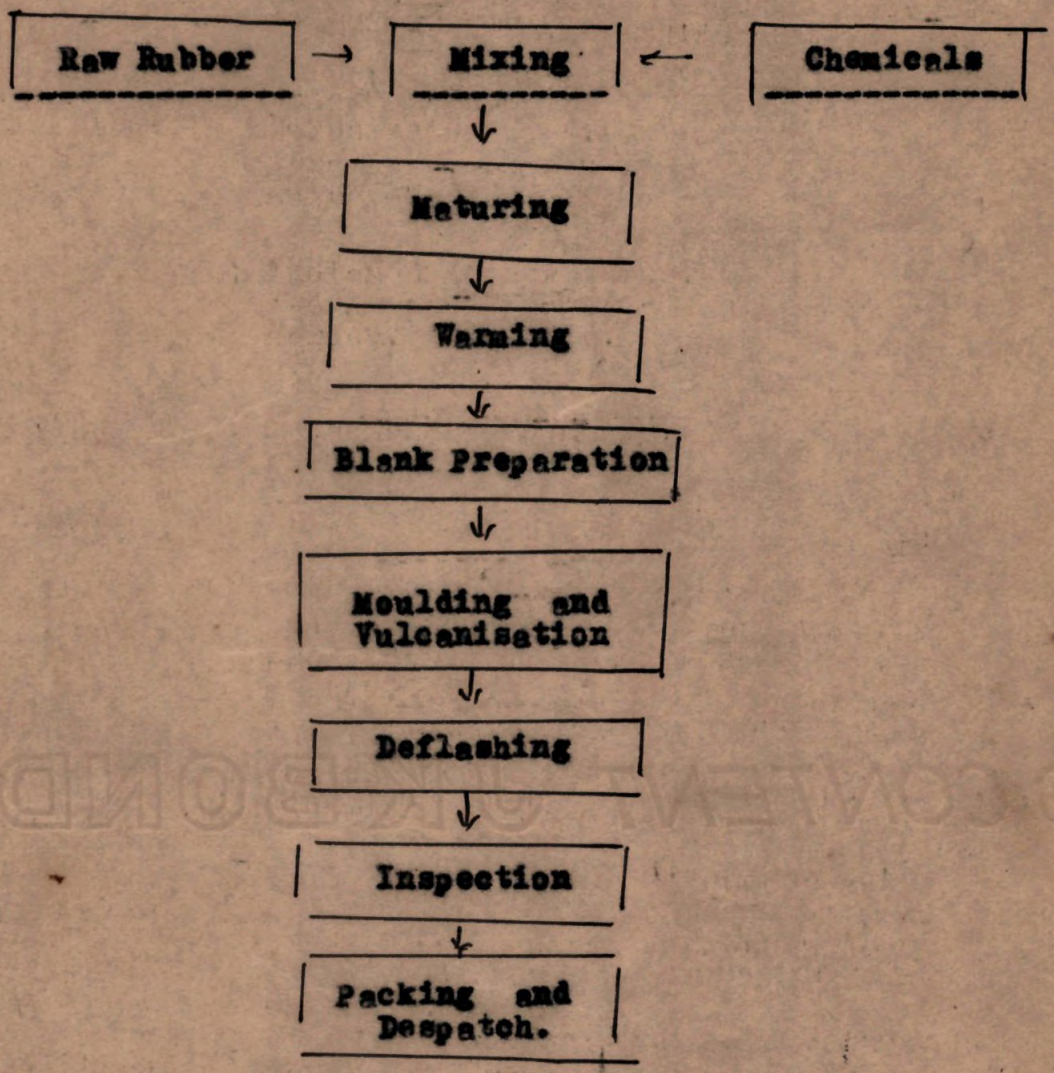
COST OF PRODUCTION

(1)	Raw materials	Rs.216390
(2)	Salaries and Wages	Rs.143300
(3)	Utilities	Rs. 25523
(4)	Other over heads	Rs. 20000
(5)	Interest on Working capital loan (16% interst)	Rs. 16368
(6)	Interest on block loan (7.5%)	Rs. 13762
(7)	Depreciation	
	(a) On Machinary (15%	Rs. 27525
	(b) On other fixed assets and preoperative expenses (10%)	Rs. 2790
	Total	Rs.465698

Round of Rs.465700/-.

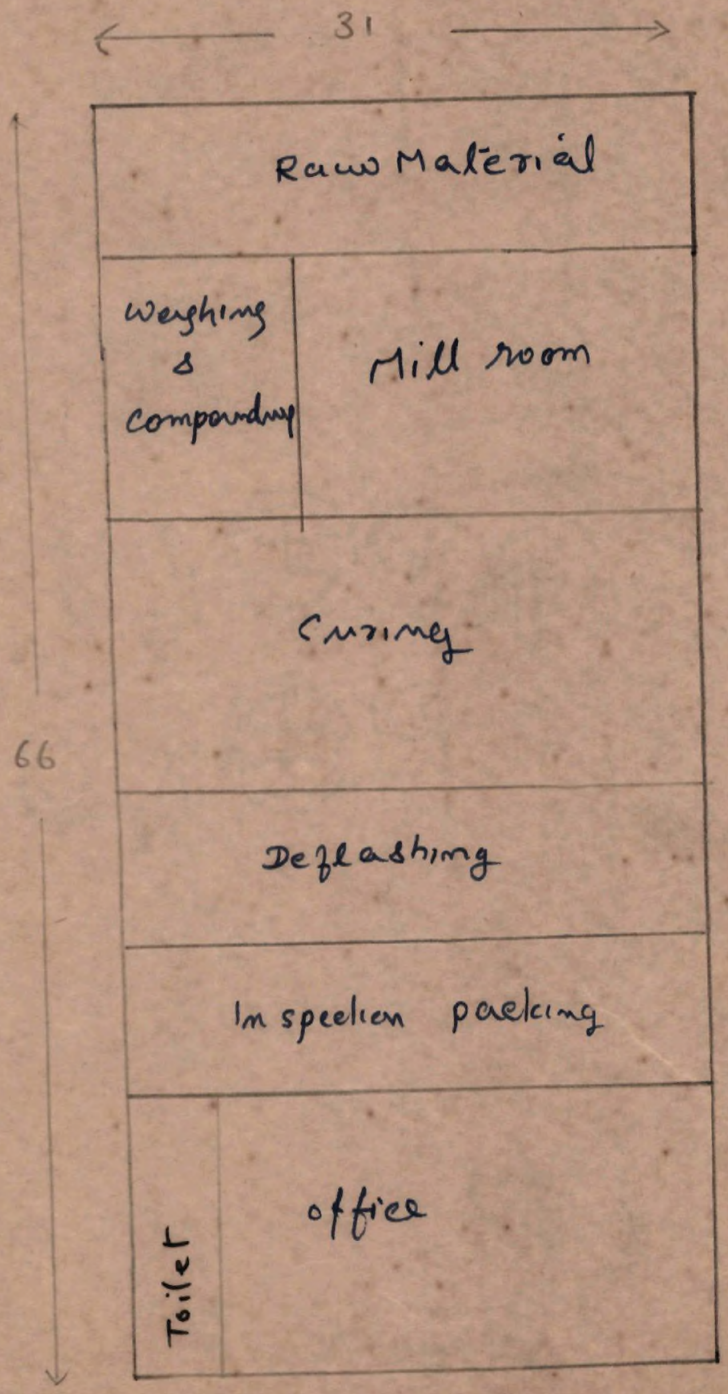
APPENDIX - I

PROCESS FLOW CHART.



APPENDIX-2

Typical Lay out



LIST OF SUPPLIERS OF MACHINERY

(a) Rubber Mixing Mill and Presses

1) Richardson & Crudas Ltd.
Byculla Iron Works,
Bombay-4000

2) Sohal Engineering Works,
Tulasi Pipe Road,
Agra Road, Bhandup,
Bombay-78 MB.

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

4) Kelachandra Foundary,
Chingavanam P.O.,
Kottayam.

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

6) Common Fecility Centre,
Chengannacherry.

(b) RUBBER CHEMICALS.

1) Alkali & Chemical Corporation of India Ltd.,
Calcutta.

2) Bayer (India) Ltd.,
82, Vir Nariman Road,
Bombay-1.

3) Mindia Chemicals Ltd.,
Wake-field House, 11 Sprott Road,
Ballard Estate,
Bombay-1.

4) Para Chemicals,
C/o Kerala Paints Pvt. Ltd.,
Mahatma Gandhi Road,
Ernakulam, Cochin-2.

5) Organo Chemicals Industries,
Sonepat - Agents,
Rishiroop Chemicals Co.,
160 DN Road, 1st Floor,
Bombay-400001.

6) United Carbon India Limited,
N.K.M. International House,
Backbay Reclamation, Bombay-400020.

7) Philips Carbon Black Ltd.,
Duncan House, 31 Netaji Subhash Road,
Bombay-400001.

8) Kamani Metalic Oxides Pvt. Ltd.,
Kamani Chembers, Nicol Road,
Bombay-400001. — Zinc Oxide

9) Godrej Soaps Pvt. Ltd.,
Vikhroli, Bombay-400079. — Steric Acid

10) ESSO Standard Eastern Inc.,
17 J Tata Road,
Bombay-400001. — Process Oils

11) Burmah shell oil storage and Distrb.,
Company of India Ltd.,
Burmah Shell House, Bombay-400001.

12) English India Clays,
Trivandrum. — China clay