UNIVERSITY OF COCHIN

B. Tech. Course

In Rubber Processing And Technology

PROJECT REPORT ON
A SMALL SCALE RUBBER COVERED ROLLER MANUFACTURING UNIT IN KERALA

DISSERTATION REPORT

Submitted by

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C O N T E N T S

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SECTION. A.

INTRODUCTION

This is a scheme for producing rubber covered rollers according to the following production schedule.

1. Textile rollers — 75 Nos./month.
2. Printing rollers — 75 Nos./month.

Printing rollers are of smaller size. The size ranges from 12-40 inches in length and 2-4 inches in diameter. Industrial rollers are of larger size with 70 inch length and 7-8 inch diameter. The rubber covered rollers are production tools in a score of Industries, ranging from type-writer to textile Industry. All items of machinery and raw materials required for the production of rollers are indegenously available.

A. 1. Product Description.

A rubber covered roller is a cylinder of rubber bonded to a rigid core which is usually made of metal. The size of this varies from very tiny ones, used in typewriters to the giant press rollers employed in paper making industry. The hardness of compounds used for covering varies from 10-100 shore hardness. Compounds are designed according to the end use of the rollers. Textile rolls for the most part are supplied in hardness of about 85 durometer. Printing rolls are usually soft with hardness below 50 durometer and must be resistant to solvents and inks of all kinds. These rolls operate at very high speeds.

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SECTION. B.

MARKET SURVEY

B.1. Product applications.

Rubber covered rollers find a variety of applications in the industrial field. They carry, they pull, they protect the material against chemical attack and handling damage and they apply liquid or wipe liquid off a surface. For purpose of classification rubber covered rollers are divided into four categories according to the industry being served, paper, steel, graphic arts and industrial.

Paper rolls are the largest rubber covered rolls. These rolls operate at very high speed of about 4,000 ft/minute. The hardness of the rolls comes to about 80 durometer.

Textile rolls are the largest single group among industrial rolls. Leather tanning and rice polishing rolls also come under this. These rolls operate at some what slower speeds and should be white in colour.

The Steel industry is one of the largest users of rubber covered rolls. All the pickling, plating and steel finishing lines contains rubber covered rolls, which are used for pulling as hold-down rolls, as wiping rolls and as brakes.

Graphic arts employ many rolls for printing.

B. 2. Market Survey.

Rubber covered rolls consumes only a very little part of the total rubber consumed in the country. Eventhen the production potential of rollers are high. There are about 110 units manufacturing rubber rollers in India, out of which only 2 units are

doing this job in Kerala. The orders for rubber covering of rollers have been steadily increasing and so most of the units producing them are doing additional shifts to meet the demand. Though the specific information on capacity, production and demand of these items are not available based on the performance of existing units and based on the enquiries made in local units, it is clear that there is good demand for the product.

B.3. Prospects of the Proposed Project.

Nothing can substitute rubber covered rollers and the Industries using there are always on the increasing. Eventhough the proposed project is specially prepared for the production of printing and Textile rollers, any type of rolls can be manufactured with the existing machinery. In the case of moulded rollers, such as typewriter and wringers, a hydraulic press is the only additional equipment required.

The work is of job order type and where rolls are produced according to customer specification. As the concerns whose rolls have to be recovered want the deliveries in a short times, and the existing number of units are not in a position to meet the demand, it is very easy for getting orders for recovering.

B.4. Specific market.

The main market areas will be states like Tamilnad, Maharastra West Bengal and Punjab where textile and leather industries are clustered. For covering printing rollers local orders can

also be obtained. Other work on specific orders can also be undertaken.

B.5. Geographic extent of Market.

Most of the market is within the country. Overseas orders from African and middle east countries can also be obtained for making new rolls, according to their specifications. Export statistics show that expert potential of rubber rollers is increasing especially for printing rollers.

B.6. Marketing Channels.

Recovering orders will have to be collected from existing concerns using rolls. These concerns will send the core with the covering specification. There rolls will be cleaned and covered freshly and send back to the customer within the specified period.

In the case of new rolls, core also has to be produced and machined, in lathe and covered. As the number of lathes proposed to be bought are only two, this work can'nt be undertaken. Hence the manufacture of spindles can be assigned to ancillary machine shops.

B.7. Product pricing.

Products are priced according to the size of the rolls and polymer used for covering. In the case of small rollers, area of covering is considered. In large industrial rollers

volume covered is taken into account. For the Printer's rollers the charge is fixed at Rs. 0.75 per squire inch and for industrial rollers charge is Rs. 0.60 per Cubic inch. Selling price is inclusive of excise duty. For specific orders the rates are quoted accordingly.

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SECTION. C.

PRODUCTION REQUIRE MENTS

C.1. Location

Design of location is very important in any industrial undertaking since,

1. A plant is relatively immobile and once it is established it is permanent.

2. Location has a considerable influence on operating cost and productivity. The plant site will be selected after consideration of the following factors.

1. Availability of raw materials
2. Availability of skilled labour.
3. Availability of water and power.
4. Marketability.
5. Facilities for transport and communication.

Proposed Unit can be located where rollers can be easily marked or where raw materials are easily available. As the roller market is widespread, the factory can be located in Kerala where raw material is available in plenty. Availability position of power, water and skilled labour are also good.

The factory can be located in backward areas in Kerala so that incentives provided by government, such as reduction in taxes etc. can be enjoyed at the marginal cost of some other facilities. Alternate choice of location may be in an Industrial

Estate in Kerala. The advantages of such a selection are the following.

1. Built up area available at a nominal rent.
2. Undue delay in getting power connection can be avoided.
3. Reduced overhead expenses.
4. Facilities available for transport and communication.
5. Facilities available for training labour.

Considering all the above factors and their advantages a suitable location can be selected.

C.2. Raw material requirements.

The basic raw materials required are different types of polymers such as Natural Rubber, Styrene-Butadiene rubber and Nitrile rubber. Other important chemicals required are stearic acid, ZnO, Solvents, clay, process aids, fillers, tackifiers and curatives.

Based on the current day prices of raw materials monthly requirement comes to about Rs. 47,000. Details of raw material requirement are given in Annexure II.

Raw material requirements are calculated based on standard formulations as given in Tables C-1, C-2, and C-3 and assuming some standard sizes for rollers.

Source of Supply.

All raw materials are available indigenously. Several agents are available in the country to supply rubber chemicals.

List of Chemical suppliers are given in Annexure IX most of them have got depots or agencies in Kerala.

Terms of Purchase.

All negotiations are done through banks. On a margin money of 30% the bank will spent 70% for the purchase of materials. This amount has to paid back in 70 days with interest All materials purchased will be pledged to the bank.

Base formulations.

1. PRINTING ROLLERS

TABLE. C-1

	Parts by weight.
Chemaprene 3309 X	100
Zinc Oxide.	5
Stearic acid.	2
Carbon black FEF	20
Brown factice.	35
Precipitated Calcium Carbonate.	20
Naphthenic oil.	10
D. O. P.	20
Antioxident PBN.	1.0
MBTS	1.5
Sulphur.	2.0
	216.5

2. TEXTILE ROLLERS

TABLE C-2.

	Parts by weight.
Natural Rubber.	80
SBR (Synaprene 1552)	20
Hard Clay.	150
Zinc Oxide.	10
Wood rosin.	2
Mineral oil.	3
Magnesium Oxide.	6
Stearic acid.	1.5
Sulphur.	4.5
Nonox. SP	1.5
Vulkacit P.	1.0
	279.5

Cure in open steam. 1" thickness. One hour at each progressively increased steam pressure of 20,25,30 & 40 psi.

3. EBONITE BASE STOCK FOR TEXTILE ROLLERS.

TABLE C-3

	Parts by weight
RMA IX	100
Red Iron Oxide.	50
Magnesium Oxide.	10

Zinc Oxide	50
C.I. Resin.	2
Accelerator.	1.5
Sulphur.	40
	253.5

C.3. DETAILS OF FIXED ASSETS.

Land and Building.

The total area required for the factory with provisions of expansion is estimated to be 50 cents. The plant area comes about 2,000 squire feet. The total cost of land building comes to about Rs. 90,000. The plant area can be divided as follows.

1.	Mixing and Sheeting.	500 Sq.ft.
2.	Space for Roller covering.	300 Sq.ft.
3.	Vulcanisation equipments.	200 Sq.ft.
4.	Compounding room.	150 Sq.ft.
5.	Office and Stores.	500 Sq.ft.
6.	Grinding Section.	350 Sq.ft.
	Total.	2,000 Sq.ft.

Plant and Machinery

Machinery required are of four types.

1. Mixing Equipments
2. Roller covering Equipments.

3. Curing Equipments.

4. Grinding lathes.

Basic machinery for mixing is mixing mill 36x14" size, with chilled cast iron rolls, driven by a 40 h.p. motor. Capacity of mill is 20-25Kg. per batch. The other equipment is a 2 - bowl sheets roll driven by a 50 hp motor.

Roller covering equipments include stands for mounting rollers, consolidating equipments etc.

For vulcanisation an autoclave of size 4x12 feet is installed horizontally on the ground. Rails and accessories for placing, rolls inside the autoclave. A boiler with a capacity 150 Kg. of steam per hour is installed for steam generation. Grinding lathes are two in number, one 6 ft lathe for small size rollers and one 16 ft lathe for large industrial rollers.

In addition to this the requirements to the plant are water pumps, water tanks, factory lighting and other overhead expenses. Details of fixed assets are given in Annexure I. Total fixed capital requirement comes to about Rs. 5,90,000.

All the machinery are manufactured indegenously and the list of suppliers are given in Annexure X.

Terms of Purchase.

Quotations are made and satisfactory quotations are confirmed. Price quoted are exclusive of packing and transportation costs,

sales tax etc.

30% of the price should be paid in advance and remaining at the time of purchase. Payment can be done through banks.

Purchaser has the right for inspecting the machinery.

Supplier posses the right for cancellation, changing delivery time and prices due to unforseen reasons.

Normal delivery period of major machinery varies from 2-5 months.

Liabilities passes on to the customer immediately after despatch and shortages should be noted within a week.

C.4. MAN POWER REQUIREMENTS.

Total number of personnel including administration and managerial are 20. Details of man power requirements are given in Annexure IV. Total wages per annum with 15% benefits comes to about Rs. 89,000.

Training Programme.

As the roller covering is a skilled job, some training programme may be necessary for the workers. For efficient functioning well experienced chemists and operators are necessary. Being a small unit which can not afford such an elaborate training, this may be arranged in institutions such as common Facility Service Centres. Further training may be given in the factory itself with the one experienced hand available.

C.5. INFRASTRUCTURE AND OTHER FACILITIES.

1. Roads.

For efficient functioning of any industry transport facility is essential. To bring raw material into the factory and to haul the finished product into the market transport facilities are unavoidable. As this small unit can't afford to make roads at its own cost, it is proposed to locate the factory in a place nearer to the main road having easy accessibility to the market and port and railway station.

2. Water Supply.

The factory being located in Kerala water supply is not a problem as it is available in plenty, round the year, free of cost.

3. Power.

Adequate, continuous supply of power is essential for industries. As the factory is located in a state where electricity is surplus power is not a problem. If the factory is located in Industrial estate delay in power connection can be avoided.

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SECTION. D.

PROCESS OF MANUFACTURE

D.1. PROCESS DETAILS.

Flow diagram of the process is given in ANNEXURE VIII.

Compounding.

The polymers for the production of rollers should have good processibility, building tack and green strength. In the case of printing rollers, the main requirements are

1. Sufficient mechanical stability.
2. Capacity to withstand the solvents contained in the inks.
3. A smooth and absolutely even surface capable of applying printing inks at a high speed.

Considering all these nitrile rubber seems to be the best choice for printing rollers.

In the case of Industrial rollers they should have

1. Sufficient mechanical stability and good dynamic properties.
2. Uniform hardness through out the cover.
3. Resistance to chemicals used in the process.

General propose rubbers such as SBR and Natural rubbers will meet all thege requirements.

As uniform surface hardness is essential good disperson and filler selection is important. Of non-black fillers day

clay, precipitated whiting and calcium carbonate find good acceptance. For chemical resistance inert substances such as barytes, clay etc., are used. For pigmentation titanium dioxide or lithopone with organic pigments are used. In Nitrile rubber compounding large amount of plasticiser DOP is added. Other process aids used are brown factice and naphthenic oil. For black compounds furnace blacks (FEF) can be added. In such cases loading has to be so adjusted that it will not impair calendering, plying and adhesion properties. MBT boosted with DPG find the best accelerator choice. Magnesia and lime are used on the grounds that rigidity is increased during early stages of vulcanisation.

Mixing.

Compound is mixed in mixing mill. Sulphur and accelerator are best added in masterbatch form to prevent agglomeration. Then the compound is sheeted out in 2-bowl sheeter roll. During sheeting air entrapment should be reduced to the minimum.

Spindle Preparation.

To obtain good adhesion the metal surface of the spindle must be free from moisture, grease, dirt., oil, Scale and rust. First spindle is cleaned in the lathe with cleaning tool. Any voids in the metal are plugged with the tie gum Cement and given a solvent wiping before bonding.

Bonding.

To avoid oxidation a primer coat is applied to the spindles as soon as possible after cleaning. Primer coat may be of

isocynate type. Drying between each coat, two coats of ebonite solution followed by a thin layer of ebonite sheet 2-3 m.m. thick is applied to the core. For small printing rollers Proprietory adhesives alone are used.

Plying and Wrapping.

The Calendered Sheet, free from crow's feet, is applied to the Spindle by hand using a hand roller, care being taken to ensure freedom from air entrapment. Blisters are removed by pricking with a needle carefully. If the compound is not tacky enough a solvent can be used to make it so.

Alternate method of manufacture consists of vulcanising the ebonite lining first and then grooved in a lathe followed by application of calendered sheet as mentioned above.

Starting from the centre and working towards each end and the covered roll subsequently cloth wrapped on a lathe with either nylon or damp cotton tape. The speed of winding and tension being kept as constant as possible.

To facilitate removal of tape after vulcanisation, the roll surface can be covered with treated with paper prior to winding. To prevent flow during wrapping and vulcanisation guide or blocking plates are installed at both ends of the roll.

Vulcanisation.

Vulcanisation is carried out in an autoclave, in hot air or stea under pressure. To eliminate blowing step cure is employed,

allowance being made for metal core when selecting cure time. Prior to cure autoclave is preheated. The cloth wrapping material shrinks during cure and therefore creates considerable pressure which prevents the rubber from sagging and becoming porous round the core. In the case of large diameter rollers core should be vented in some manner to allow the rubber covering to be heated from inside. To avoid distortion during vulcanisation the rolls are suspended or stood on end in the autoclave. After vulcanisation they are cooled to room temperature, and the wrapping cloth removed.

Grinding.

The rolls are subsequently ground to the required diameter and cut to length on a lathe. The grinding wheel traverses the length of the cover and removes only a thin shaving with each cut. Lubricants are unnecessary, except with ebonite where water is required. If the roll has to work under heavy loads and also minimise wear during service, a crown finish is applied. For smother finish sand paper along with talc applied.

D.2. PROCESS LOSS.

Process loss are due to

1. Stocks wasted off due to improper covering, scorched Scraps etc.
2. Roll grindings.

Totally about 5% of the compound goes out as the waste.

D.3. Utilisation of Bye-Product.

Roller grindings can be used as a filler for compounding ebonite base stock.

D.4. Waste disposal.

Factory wastes can be disposed as follows

1. Grinding can be re-used.
2. Unvulcanised scraps can be sold in the local market.

Other scorched stocks can be scraped out of hand for reclaiming

D.5. QUALITY STANDARDS AND SPECIFICATION.

The products are manufactured strictly to the standards and specifications required by the purchasing units Hardness of rolls are checked using a durometer.

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SECTION. E
UTILITIES

E.1. WATER

Water is required in the factory for the following proposes.

1. Cooling mixing mills, two bowl sheeter and for boiler working.
2. Toilet proposes.

Total water requirement per day is calculated as follows.

1.	Mixing Mills.	2,000 litres.
2.	Two-bowl sheeter.	2,000 litres.
3.	Boiler working.	1,000 litres.
4.	Other proposes.	2,000 litres.
	Total.	7,000 litres.

So the annual water requirement comes to about 2100 Kilo Litres. The factory site should therefore be selected where water is available abundantly, free of charge.

E.2. POWER.

Main source of power is electricity. The transformer required for the propose will be installed by the electricity board. The power requirement is about 76 K.W. Details of power requirement is given in table E-1.

TABLE. E. 1.

Item.	Power K.W.
1. Mixing Mill.	30
2. Sheeter roll.	37.25
3. Lathes.	1.5
4. Pumping for Boiler.	0.75
5. Water Pumps.	1.5
6. Lightings.	5.0
Total.	76.00

Assuming the power factor to be 0.80 the total power consumed per day is about 95 KW. Therefore the transformer to be installed should be of 100 KVA.

Annual Consumption of Electricity = 3,42,000 KWh

Cost of Electricity @ 15 Ps. per KWh = Rs.51,000

E.3. STEAM

Boiler of capacity 150 Kg/hr is installed and autoclave used is of size 4x12 feet. The autoclave is working only for one shift with a maximum pressure of 45 psi. The steam consumption calculated giving due allowance to all factors comes to about 100 Kg./hr. operating cost of boiles can be calculated from the furnace oil consumption. The efficiency of boiler assumed to be 100 Kg. of steam for 10 litres of furnace oil.

Furnace oil requirement/day	80 litres.
Annual requirement.	24,000 litres.
Cost of Furnace oil @ Rs. 1.05 per litre	Rs. 25,000

Total cost of utilities are summed up in Table E-2

TABLE. E. 2.

Items.	Cost Rs.
1. Water.	------
2. Electricity.	51,300
3. Steam.	25,000
Total.	76,300

SECTION F
FINANCIAL ASPECTS

F.1. MANUFACTURING COST.

Manufacturing cost include all direct and indirect cost involved in the manufacturing operations. It includes cost for raw materials, utilities, sundry expenses, plant overhead, sales and administration expenses.

F.1.1. RAW MATERIALS.

Total raw material requirement as given in Annexure II, comes to about Rs. 5,64,000 per annum.

F.1.2. UTILITIES.

Total cost of utilities as given in table E.2 is Rs. 76,300.

F.1.3. DIRECT PERSONNEL COST.

Direct personnel cost include cost on direct labour and direct supervising staff. This cost is calculated according to the details given in Annexure IV.

Direct personnel Cost	Rs. 62,400
15% benefits.	Rs. 9,360
	Rs. 71,760

F.1.4. PLANT OVERHEAD.

Plant overhead includes maintenance and repair, factory lighting and purchasing, inspection and warehousing. Details are given in Table F.1.

TABLE F.1.

Item.	Cost.
	₹
1. Maintenance and repair (5% of fixed capital)	2,90,40
2. Lighting and Ventilation.	2,000
3. Purchasing, warehousing etc.	2,000
Total.	33,040

F.1.5. SALES AND ADMINISTRATION EXPENSES.

This can be broken into marketing expenses and general administration expenses. There are given in Table F.2.

TABLE F.2.

Item.	Cost.
	₹
1. Marketing Expenses.	5,000
2. Administration Expenses.	
i. Administration Personnel.	17,400
ii. Postage and Telephone.	2,000
iii. Legal and Audit charges.	1,000
iv. Travelling Expenses.	2,000
v. Stationary and Supplies.	2,000
vi. Miscellaneous.	2,000
Total.	Rs. 31,400

F.2. FIXED CHARGES.

Fixed charges include depreciation, insurance, interest on loans etc. Details are given in table. 5.

TABLE. F. 3.

Item.	Cost. Rs.
1. Depreciation	
Building. 5%	4,500
Machinery 10%	43,800
2. Insurance (1% of fixed Capital)	5,800
3. Interest on term loan for machinery @ 7.5%	33,930
4. Interest on working Capital loans @ 16%	20,000
Total.	1,08,030

F.3. FIXED CAPITAL

Fixed Capital is the sum of expenses incurred for land, building, plant and machinery, other fixed assets and pre-operative expenses, that can be capitalised under present company low provisions.

Estimated fixed capital requirements are as follows.

1.	Land and Building.	Rs. 90,000
2.	Plant and Machinery.	Rs.4,73,500
3.	Pre-operative Expenses.	Rs. 12,000
4.	Other fixed assets.	Rs. 14,500
	Total.	Rs.5,90,000

F.4. WORKING CAPITAL.

Working Capital is the working expense for a definite period (usually taken for 2-3 months) which depends on the time to market and get the sales value. It includes raw materials, wages and other overhead expenses. The working capital requirement calculated for 3 months is Rs. 1,94,000 as given in Annexure III.

F.5. TOTAL FINANCIAL REQUIREMENT.

Total financial requirement is sum of fixed capital and working capital.

	Rs
Fixed Capital.	5,90,000
Working Capital (3 months)	1,94,000
	7,84,000

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SECTION. G.

G.1. FINANCING PLAN.

As the entrepreneous can't afforted to take all the Capital requirement for setting up the factory from his own pocket he has to plan sufficiently early to raise the required capital. The financial institutions and Nationalised banks are at his help. Financial institutions usually provide up to 80% of fixed capital requirements. Certain institutions give it as cash loan and others as machinery on hire purchase.

Some of the financial institutions and nature of assistance they provide are described below.

1. STATE FINANCIAL CORPORATION

They provide 100% machinery cost, 75% of building cost, 40% of working capital at 7.5% interest up to 10 lakhs. Repayment starts after two years and should be complete within 10 years.

2. KERALA STATE SMALL SCALE INDUSTRIES DEVELOPMENT CORPORATION

Provides hire purchase facilities. Interest 7.5%.

3. NATIONAL SMALL SCALE CORPORATION, NEW DELHI.

Hire purchase facilities for machinery. Interest 7.5%. Pay back period 7½ years.

4. THE INDUSTRIAL DEVELOPMENT BANK OF INDIA.

This bank gives financial assistance directly to Industries. Interest rate ranges from 15-16%.

5. COMMERCIAL BANKS.

Nationalised bank provide advances for machinery on 25% margin money and 12% interest. For working Capital the required amount can be drawn with 16% interest. Pay-back period is 3 years.

In the present scheme the total Capital requirement is 7,84,000 rupees. This amount is proposed to be realised in the following manner.

1.	Borrowings from Financial Corporation.	Rs. 4,63,000
2.	Loans from Nationalised Banks.	Rs. 1,25,000
3.	Own Capital.	Rs. 1,96,000
	Total.	Rs. 7,84,000

In the proposed scheme no foreign exchange is required.

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SECTION. H.

PROFITABILITY

Financial viability of the project can be gauged through the profitability. The following factors are examine in this.

1. Rate of return on own capital employed.
2. Rate of return on own capital employed.
3. Percentage profit on sales turnover.

In the proposed project annual gross profit is Rs. 2,35,950 and net Profit 1,66,000 Rupees.

H.1. RATE OF RETURN ON OWN CAPITAL.

Own Capital.	Rs.	1,96,000
Net Profit.	Rs.	1,66,000
∴ Rate of return on own Capital.		84.7%

H.2. RATE OF RETURN ON OWN-CAPITAL EMPLOYED.

Fixed Capital.	Rs.	5,90,000
Working Capital.	Rs.	1,94,000
Total Capital invested.	Rs.	7,84,000
Net Profit.	Rs.	1,66,000
∴ Rate of return on capital employed.		0.211 (21.1%)

H.3. PERCENTAGE PROFIT ON SALES TURNOVER.

Annual Sales.	Rs.	12,22,000
Net Profit.	Rs.	1,66,000
Percentage Profit on Sales turnover.		13.58%

SECTION. I

ECONOMIC VIABILITY

I.1. INTEREST COMMITMENTS.

Interest for term loan from Financial Corporation @ 7.5%	Rs. 33,930
Interest on working Capital loans @ 16%	Rs. 20,000
Total interest commitments.	Rs. 53,930

I.2. ABILITY TO PAY BACK BORROWED FUNDS.

The term loan has to be paid back within the prescribed period. Savings in interest can be achieved by immediate pay-back. Of the total profit approximately 25% is retained and 75%, used to pay back term loans. Since part of the money is paid back in first year, the ability to pay back borrowings will be more, due to decrease in interest commitments.

I. 3. PAY BACK PERIOD.

1.	Annual net Profit.	Rs. 1,66,000
2.	Add Depreciation.	Rs. 48,300
3.	Available surplus (1 + 2)	Rs. 2,14,300
4.	Less Drawings.	Rs. 53,000
5.	Amount available for repayment.	Rs. 1,61,300
6.	Term loan to be paid back.	Rs. 4,63,000
7.	Pay back period.	2.8 years.
		Say 3 years.

SECTION. J.

CONCLUSION

The proposed project can be concluded in the following manner.

1.	Block Capital investment.	Rs. 5,90,000
2.	Working Capital required.	Rs. 1,94,000
3.	Total investment.	Rs. 7,84,000
4.	Working Shift/day.	2
5.	Personnel required.	20 Nos.
6.	Annual production.	1,800 rubber covered rollers.
7.	Annual Sales	Rs. 12,22,000
8.	Net Profit.	Rs. 1,66,000
9.	Return on investment.	21.1%

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ANNEXURES

ANNEXURE. I

DETAILS OF FIXED ASSETS

			Rs
I.	**Land and Building**		
	i.	Land required 50 Cents (giving due allowance for Expenses) @ 20,000/acre	10,000
	ii.	Plant and Building Area of plant 1500 sft and Office 500 Sq.ft. Total 2000 Sq.ft. Building construction cost @ Rs.40/ Sq.ft.	80,000
		Total cost of land and Building.	90,000
II.	**Plant and Machinery.**		
	i.	Mixing mill 14"x36" with 40 hp motor, chilled cast iron rolls and all accessories.	1,00,000
	ii.	2 bowl sheeter 42" size (with 50 hp motor drive)	1,40,000
	iii.	Autoclave 4x12' size.	30,000
	iv.	Trolleys rails and accessories.	20,000
	v.	Stands for mounting the rollers for covering etc.	10,000
	vi.	Boiler (capacity 150 Kg./hr)	30,000
	vii.	Lathes 1. 6 ft lathe	20,000
		2. 16 ft lathe	50,000
	viii.	Solvent oil tank construction.	5,000
	ix.	Water tank construction.	10,000
	x.	Water pumps and accessories.	2,000
	xi.	Weighing scales. 1. 100 Kg. Rs. 5000 2. 10 Kg. Rs. 2500	7,500

Annexure I Contd...	Rs
12. Office furniture and equipment	5,000
13. Hardness tester.	1,000
Total.	5,20,500
Installation cost freight charges etc (10% of M/C cost)	43,000
Power distribution lighting etc.	10,000
Pre-operative expenses.	12,000
Other Miscellaneous expenses.	4,500
Grand Total.	5,90,000

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ANNEXURE II

RAW MATERIAL REQUIREMENT/MONTH

Sl.No.	Materials.	Qty. Required Kg.	Price/ Kg. Rs.	Cost Rs.
1	Natural Rubber	2,000	9.20	18,400.00
2	Styrene Butadiene Rubber.	370	8.50	3,145.00
3	Chemaprene 3309 X	375	17.50	6,666.00
4	Clay	2,700	0.25	675.00
5	Zinc Oxide.	280	8.50 15.00	2,100.00
6	Wood Rosin.	55	5.62	210.00
7	Mineral Oil.	130	9.0	1,170.00
8	Stearic Acid.	40	11.5	460.00
9	MBTS.	40	27.0	1,080.00
10	Sulphur.	325	1.50	488.00
11	Antio-oxident			
	1. SP 2. PBN	30 5	22/- 31/-	815.00
12	Carbon Black FEF	75	4.25	320.00
13	Precipitated Calcium Carbonate.	75	1.25	100.00
14	Brown factice.	135	7.50	1,010.00
15	DOP	75	11.50	862.00
16	Cumarone Indene resin	30	15.00	450.00
17	Red Iron Oxide	240	8.35	2,005.00
18	Magnesium Oxide.	240	17.00	4,080.00
19	Dapoynate Bonding agent.	10	35.00	350.00

20.	Solvent Oil. SBP	500 litres	3.50	2,100.00
21.	Wrapping cloth			500.00
		Total.		46,965.00
	Rounded off		Rs.	47,000.00

ANNEXURE XIX

WORKING CAPITAL FOR 3 MONTHS

		Rs
1.	Raw Material.	1,41,000
2.	Utilities.	19,075
3.	Direct Personnel cost.	17,940
4.	Sales and administration Expenses.	7,850
5.	Plant overhead.	8,260
	Total.	1,94,125
	Round off to	Rs. 1,94,000

ANNEXURE IV

MAN POWER REQUIREMENT

Staff.	Working Shift.	Un-Skilled	Semi-Skilled.	Skilled	Others	Cost/ Month
1. Technical.						
i. Compounding.	2	2	--	--	--	400
ii. Mixing.	2	--	--	2	--	600
iii. Covering.	2	--	--	6	--	1,800
iv. Lathe Operators.	2	--	--	4	--	1,200
v. Supervisors @ Rs. 500 pm.	2	--	--	--	2	1,000
vi. Packing.	1	1	--	--	--	200
2. Administration.						
i. Clerk/Typist @ Rs. 250 pm.	1	--	--	--	1	250
ii. Peon/Watchman @ Rs. 150 pm.	1	--	--	--	1	150
3. Managerial.						
i. Manager/Chemist @ Rs. 1000 pm.	--	--	--	--	1	1,000
		Total.		Rs.		6,600

Wages for Labourers.

Unskilled	Rs. 200 pm.
Semi Skilled	Rs. 250 pm.
Skilled.	Rs. 300 pm.

In addition to the wages 15% additional benefit is also given.

ANNEXURE. V

ANNUAL COST OF PRODUCTION

	Item.	Cost.
		Rs
1.	Raw Material.	5,64,000
2.	Utilities.	76,300
3.	Direct labours Wages and 15% benefit.	71,760
4.	Sales and administration costs.	31,400
5.	Plant overhead.	33,040
6.	Factory Depreciation.	48,300
7.	Insurance (1%)	5,800
8.	Interest on term loan for machinery @ 7.5%	33,930
9.	Interest on working capital @ 16%	20,000
10.	Process loss (5%)	28,200
	Total.	9,12,730

ANNEXURE VI

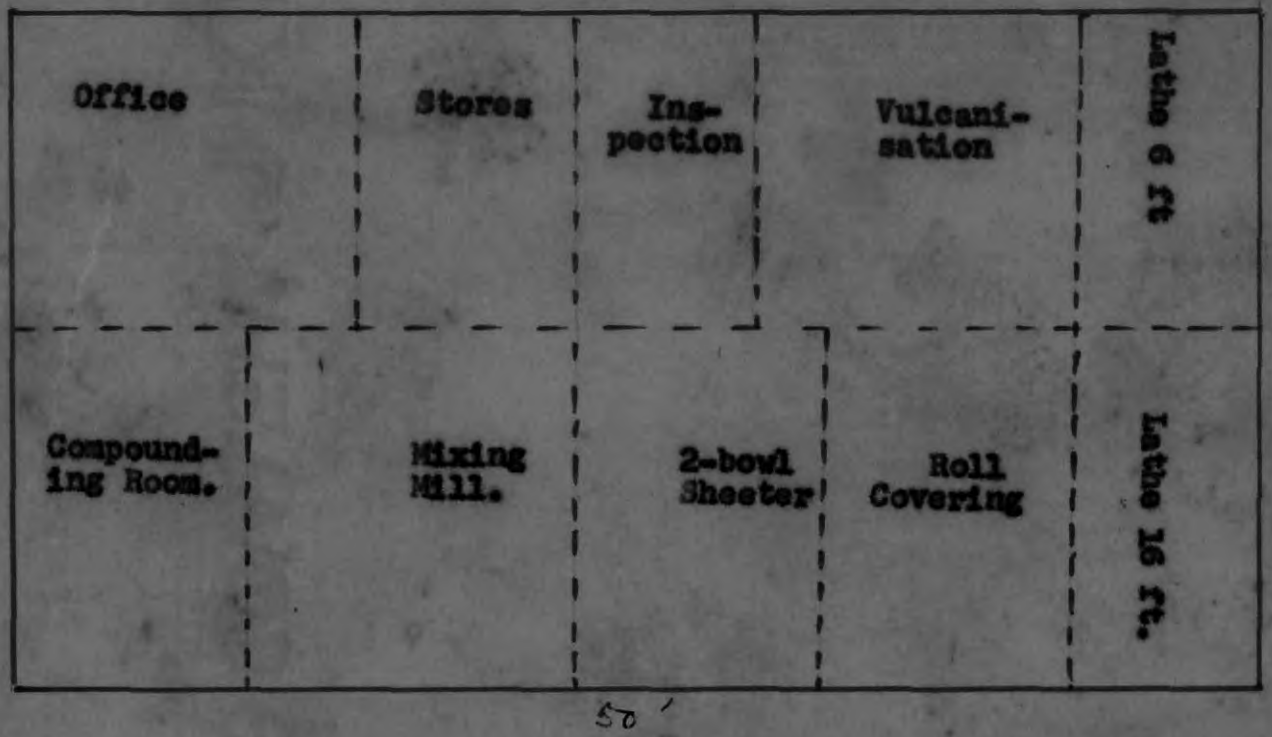
SALES INCOME AND PROFIT

SALES			
1.	9,00 Printing rollers @ Rs. 0.75 per Sq. inch.		Rs. 4,02,000
2.	900 Textile rollers @ Rs. 0.50 per Cubic inch.		Rs. 8,10,000
3.	Scraps and grindings sale.		Rs. 10,000
	Total Sales.		Rs.12,22,000
Less	Selling cost 5%	61,000	
	Excise duty 1%	12,220	Rs. 73,320
			11,48,680
Less	Cost of production		9,12,730
	Gross Profit.		2,35,950
Less	Taxes.		70,000
	Net Profit.		Rs. 1,65,950
	Round off to		Rs. 1,66,000

ANNEXURE VII

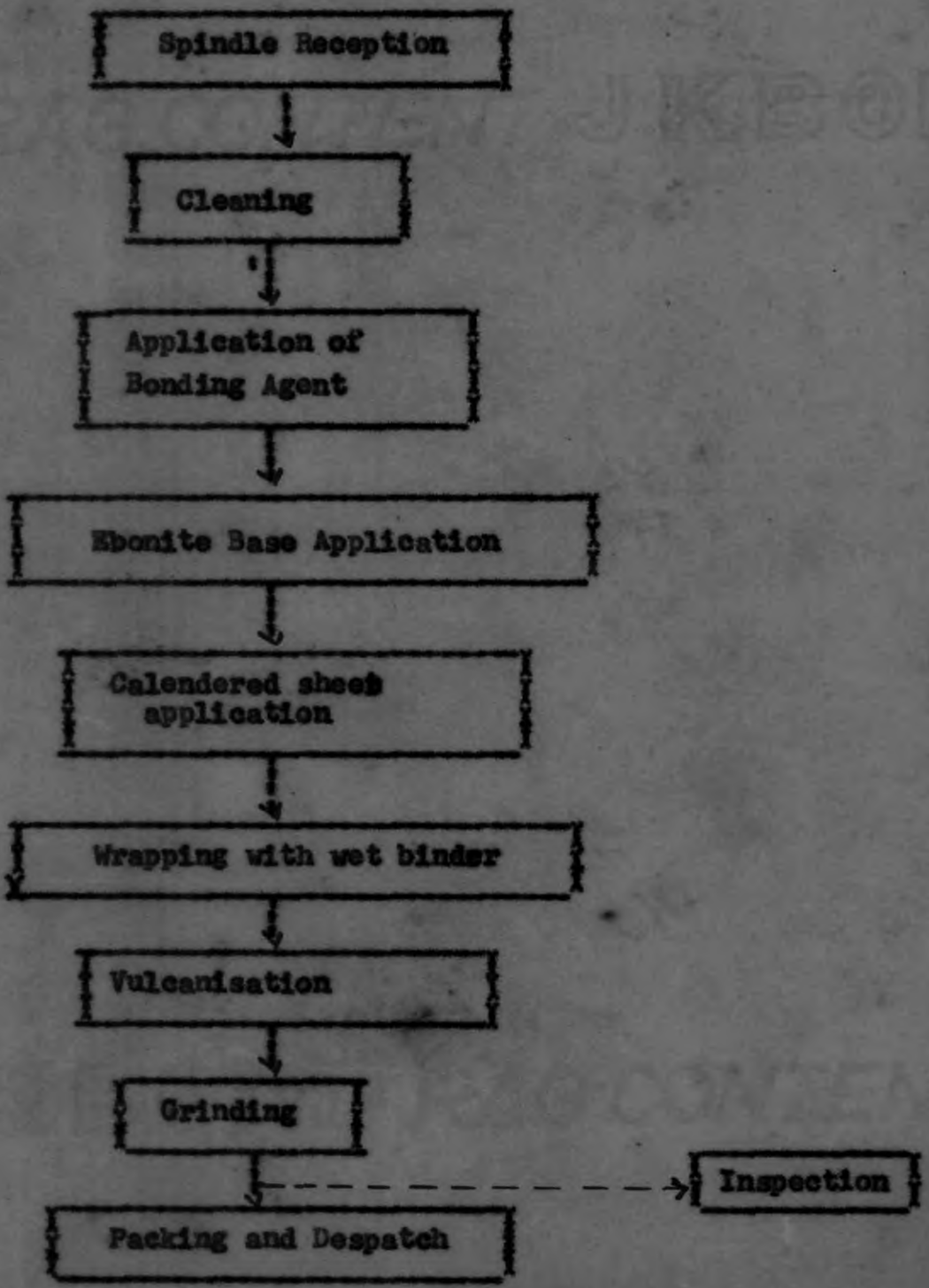
PLANT LAYOUT

Building area 2,000 Sq.ft.



ANNEXURE VIII

FLOW DIAGRAM OF THE PROCESS OF MANUFACTURE



APPENDIX IX

LIST OF RAW MATERIAL SUPPLIERS

1. Natural Rubber. Available in the local market.

2. SBR & NITRILE RUBBER

Synthetics and chemicals Limited,
New Great Insurance Bldg.,
7, Jamshedji Tata Road,
Bombay - 1.
(Sales Office Kottayam, Kerala)

3. Accelerators and Antidegradants.

a) Alkali & Chemical Corporation of Indian Ltd.,
34, Chowringhee Road,
Calcutta. 16.

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. 1.

d) Para Chemicals,
C/o. Kerala paints Pvt. Ltd.,
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.

a) Muraka Chemicals Manufacturing Company,
Labo Mansion, Sardar Vallabhai Patel Road,
Culcutta. 1.

6. Stearic Acid.

a) Goderej Soaps (Pvt.) Ltd.,
Eastern Express Highway, Vikhroli,
BOMBAY. 79.

7. Titanium Dioxide.

a) Travancore Titanium Product Ltd.,
P. B. No. 64, Trivandrum.

8. Sulphur.

a) Sulphur Mills (Pvt.) Ltd.,
23, Kailash Darshan,
Bombay. 7.

9. Mineral Fillers, China Clays Barytes Etc.

a) Amex Private Limited,
Post Box No. 215, National House,
6, Thulloch Road, Appolo Bunder,
Bombay. 1.

b) Hindustan China Clay Works,
Pappinisseri, Cannanore,
Kerala.

c) Basic Minerals and Chemical Co.,
Division of Bharat Pulverising Mills Pvt. Ltd.,
Narayan Dhuru Street,
Bombay. 3.

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ANNEXURE 10

LIST OF MACHINERY SUPPLIERS

a) Kelachandra Foundry,
Chingavanam. P.O.
Kottayam, Kerala.

b) Sohal Engineering Works,
Agra Road, Bhandup,
Bombay. 78 NB.

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

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

d) Richardson & Cruddas Ltd.,
Byculla Iron Works,
P.B. No. 4503,
Bombay. 400 008.

RUBBER TEST EQUIPMENT.

a) M/S. Kamal metal Industries,
Arum Park,
Bhaipura, Ahemmadabad. 8.

b) Indian Engineering Company,
Worli Naka,
P.B. No. 16551,
Bombay. 18.

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