UNIVERSITY OF COCHIN

B. Tech Course

IN RUBBER PROCESSING AND TECHNOLOGY

PROJECT REPORT

ON

A SMALL SCALE UNIT

TO MANUFACTURE NATURAL RUBBER LATEX THREAD

IN KERALA.

Valued. Commanded
K.G. Thomas (Examiner)
Dy. Dr. RRII
Kottayam

DISSERTATION REPORT

Submitted by,

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UNIVERSITY REG: NO. 54

In partial fulfilment of B.TECH. Degree.

28th April 1975.

FOREWORD

This project report is prepared and submitted in the form of a dissertation unlike projections to procure loan to start enterprises. The primary mission therefore, for obvious reasons is the partial fulfilment of an academic technical degree. This I believe justifies the inclusion of information on technical aspects of product manufacture. I do not claim this report to be exhaustive and complete in all respects. However it is felt the information contained therein is sufficient to start and operate the Project.

My thanks and gratitude are due to several persons who helped me in my endeavour. I express my appreciation and acknowledgement to all of them and particularly to S/Sri. V. Bhaskara Pillai Secretary, S/Sri. C.M. George and S/Sri. E.V. Thomas, Deputy Directors, S/Sri. M.K. Balagopalan and S/Sri. R.G. Unni of Rubber Board and Rubber Research Institute of India, Kottayam.

KOTTAYAM.9. C.M. PONNAPPAN.

28-4-1975.

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HIGH LIGHTS OF THE SCHEME

1.	Total investment	Rs. 2,58,300.00
2.	Total Fixed Assets.	Rs. 1,31,650.00
3.	Land.	10,000 Sq. ft.
4.	Built up area.	2,300 "
5.	Working Capital.	Rs. 1,20,000.00
6.	Personnel Requirements.	12
7.	Annual out put.	33,700 Kg.
8.	Break even production/Annum	10,500 Kg.
9.	Annual cost of Production.	Rs. 5,19,367.00
10.	Annual Income from Sales.	Rs. 6,06,600.00
11.	Profit.	Rs. 53,533.00

NATURAL RUBBER LATEX THREAD

CHAPTER. A.

Product Description.

Rubber thread is a unique rubber product having varied uses. Fabrics based on rubber threads have been used for a very long time because of their elasticity, easy to wear, tight fitting and other extra ordinary properties. The old method of production was by a process of cutting crude or compounded rubber sheet in to strips of desired width and thickness. In some cases, rubber threads were also produced by the extrusion of rubber solutions. In these methods there were limitations in the length to which and dimension at which it could be made. As the textile trade grew rapidly with the production in large numbers of high speed warp knitting machines the demand for elasticated fabrics also increased. Thus between 1930-50 the entire process of production was changed and the method of extrusion from latex gained acceptance through out the Industry.

Some of the important and common uses of thread and tape are listed below.

(1) Rubber thread combined by automatic machines with metal ribbon is made in to flexible tubing for carrying gases and liquids.

(2) Woven elastic tape is made use of in holding goggles, face shields and other protective devices for factory workers.

(3) Cables made of heavy gauge rubber treads and covered with braded fabric were used for shock absorbing purposes on airplane landing gear. Similar applications can solve special problems such as suspension of instruments etc.

(4) Fabric and tape made of elastic threads are used extensively in Orthopedic devices, bandage units etc.

(5) It is also used in the production of decorative laces.

(6) Pure gum rubber thread is necessary for the production of golf balls.

(7) It is extensively incorporated in to numerous articles of clothing such as suspenders, sock tops, bathing apparel, womens corset, infants wear, fashion and beauty clothes etc.

The possibilities for applying these materials in new ways for solving new product problems are innumerable.

The specification and performance requirements of the product are more or less same in most applications. This means that the process and production method can continue without any change for very many years. However slight changes in property

requirements may become inevitable . Finer count thread shall replace coarse count thread in the future to match the improvement and development in weaving and knitting technology. As the production technology and methods are flexible and easily changeable to meet the improvements in quality requirements with minimum of financial commitments, it is possible to run a factory for the production of latex thread, successfully.

CHAPTER. B.

MARKET SURVEY.

(1) Domestic Market.

Latex thread through a simple product has many applications. It goes in to Industrial and mechanical goods and is required in huge quantities in textile trade. Despite this fact, the mass production of this product is yet to be started in the country. NR thread is unique in performance especially in elasticated fabrics and is preferred to similar synthetic items. The principal consumption is in garment making. India with her world's second largest population therefore has to consume it in large quantities in the years to come. In order to satisfy this internal demand the present installed capacity is quite insufficient.

The Indian Rubber Directory 1970 published by Indian Rubber Industries Association lists out eleven manufacturers. How ever they did not confine to thread alone and hence the

total capital investment and labour working on this product could not be ascertained to get the definite idea. At present the number of Rubber goods manufacturers are in the vicinity of 2000, almost double that of 1970. At any rate the number of thread producers will not be more than 30 and all of them come under small scale sector in as much as thread production alone is concerned. The total consumption of rubber by all these small scale units is less than 1% of India's total production. The below given table can give an idea regarding the pattern of consumption of rubber for latex products manufacture including thread.

Year	Total Rubber Production M. Tonnes.	Latex Production M. Tonnes.	% of Latex to total Production
64-65	61057	3547	5.811
65-66	63765	4002	6.277
66-67	68685	4181	6.082
67-68	74518	4717	6.33
68-69	86615	5148	5.944
69-70	86213	5499	6.378
70-71	87237	6209	7.12

Of the total latex produced, around 60% is being consumed by foam rubber industry and out of the remaining the lion share being used for dipped goods production. From the consumption figures available with the Rubber Board the total

production of thread rubber in India, with all possible allowances for errors in estimation cannot be more than 450 ton per annum, which is only 0.36% of total NR production.

The production and consumption of NR in the country during the last decade was on the increase. The production and consumption towards the end of 5th Plan period is expected to be double that of the 4th plan end period. The development and rapid progress of textile industry is expected to give an extra impetus to the latex thread production industry in the country. Thus when viewed from different context, the future demand for the product is very much more than what it is at present.

The principal consumers are textile/readymade garment makers who procure the thread, brade it and convert it in to elastic tapes, knitted and woven fabric. Fine count high tensile strength thread has a special demand in garment making. In the country at present what is being produced is sold directly to the consumers at price mutually agreed between the parties. A price of Rs. 20 or more per Kg. is easy to fetch for fine count, good quality thread. Employment of agents or middle man are not necessary as the product never float in the market under the present situation. A large number of consuming Industries are flourished in the state of Gujarat and Maharashtra where the textile industry has already well developed. Besides, Ludhiyana, Jullender, Culcutta and Madras also hold several knitting and weaving companies who require this product.

Direct selling and distribution of the product therefore, pose no problem in the country with its vast net work of road and rails as almost all consuming enterprises are located in principal cities or important towns. However, the Industrial regions of Central and Northern part of the country will serve as the centre of market though good orders are likely from certain regions in the South also. Competition in the domestic market is unlikely for a long time to come. So much so setting up of a small scale unit with a capacity to consume 30 ton latex DRC/annum at the rate of 100 Kg./day for 300 working days in an year will therefore be a prospectful venture.

(2) <u>World trend and foreign market</u>.

Fabrics of natural rubber thread have a longer history in foundation garment especially in the Western countries. At the begining of 1960's a new type of synthetic thread based on poly Urethene appeared in America. This thread though more expensive than NR have certain superiority as well over NR thread. Despatch heavy competition NR thread production in the world is reported to be doubled during 1960-70. At the beginning of 1970 the world production of latex concentrate was estimated to be 3 lakh tonnes, 10% of which was creamed latex concentrate solely used for latex thread production. The present world production of NR thread is more than 30,000 tonnes annually and this item is still preferred in many products for its superior elastic behaviour. The Natural Rubber Thread

Promotion compaign launched by U.K. thread manufacturers joined with Malayan Rubber Fund Board, in the recent past brightened the prospectus, of the rubber thread industry. A reference to the monthly statistics of Foreign trade of India gives to understand that elasticated fabrics, vulcanised rubber thread and cord are exported regularly to Belgium, Germany, Hungary, Ireland, Japan, U.K., U.S.A., U.S.S.R. etc Therefore the chances for export also cannot be ruled out. Participation in the Export Aid to small Industries (EASI) Scheme is desirable in the first stage of augmenting the production.

CHAPTER. C.

PRODUCTION REQUIREMENTS.

(a) Location

It is a usual practice and most important too, when looking for alternative sites for locating the factory, to select that site which offers the greatest advantage. The points to be considered are:

1. Availability of power, water and fuel.
2. Nearners to raw materials and vendors.
3. Facilities for transporatation (Rail, Road and water)
4. Availability of skilled and unskilled labour.
5. Satisfactory climate and surroundings.
6. Proximity to market.

Ideal location in most cases are in achievable and the possible way out is a compromised selection bearing in mind the points knowingly sacrificed to take appropriate corrective measures.

In as much as thread production within Kerala State is concerned promimity to raw material and vendors and facilities for easy and most convenient transportation are important. A suitable site in the District of Kottayam will be most ideal since it is easy to procure the main raw material preserved field latex at reasonable prices. Besides agents and suppliers of other raw materials and chemicals are also available here. This district is the home state of rubber which can be called with full merit in rubber industry parlance "The Rubber District of India" has to its credit the highest number of rubber holdings, biggest area under rubber and rubber estates besides maximum licensed dealers fortified with the long tradition of rubber cultivation combined with the rare asset of experienced and skilled labour for the production of any rubber item, a national Rubber Research Institute and a common facility Service Centre (CFSC) exclusively for rubber and plastics.

The layout of the plant should be so designed so as to facilitate smooth and logical flow of raw material and inprocess inventory so as to reduce the material handling expenses and time to achieve maximum productivity.

(b) Plant, Machinery and equipments.

It is desirable to procure a quarter acre land (10,000 Sq.ft) in the suburbs of Kottayam town. This much area will provide ample space for the construction of a factory with 2300 Sq.ft. and enough compound to meet future expansion. At any rate the plot shall not be less than 6000 Sq.ft. The estimated cost of land is Rs. 5000/- and cost of construction not more than Rs. 30/Sq.ft. Which works out to Rs. 74,000 for land and building.

(c) Equipments and Machinery.

Only cheap machinery and equipments are used in thread production. There are no authorised dealers for main items of equipments. All items can be locally purchased and fabricated. Main items of machinery and equipments are listed below.

		Nos. Required.
1.	Creaming tank concrete built 2'x2'x4'	4
2.	Compounding vessels/drums (200 litres capacity)	3
3.	Storage and maturing tanks (200 litres capacity)	4
4.	Extrusion tank-glass built 4'x1'x2'	3
5.	Coagulation bath - Aluminium built. 5'x10'x¾'	2
6.	Brick built hot-water circulation leaching bath.	2

7.	Motor ½ H.P.	2
8.	Hot air tunnel.	2
9.	Ball-Mill.	1
10.	Equipments for winding thread.	10
11.	Vulcanising oven.	1
12.	Scales.	2

(d) Approximate area requirement

		Square Feet.
1.	Creaming and Compounding	250
2.	Extrusion.	1000
3.	Store-raw materials.	100
4.	Hot air vulcanisation.	100
5.	Packing and despatch.	200
6.	Laboratory.	150
7.	Office.	400
8.	Amenities for Staff and Workers.	100
9.	Total built-up area.	2300

(e) Raw Materials and Chemicals.

The principal raw material to be consumed is preserved field latex. Several licenced dealers are locally available. The price is not expected to go beyond Rs. 9.50 per Kg.DRC.

Other materials are rubber chemicals of latex application which can be purchased from dealers and agents available around Kottayam town.

Estimated total cost/annum is Rs. 3,76,500.00

A list of raw materials and chemicals vis-a-vis price and annual consumption is given in Annexure ~~No.~~ 'A.'

(f) Labour and Staff requirement.

As enlightened elsewhere this is non-problamatic in this "Rubber District". The estimated personnel requirement is 12 as listed below.

			Rs
1.	Manager-Cum-Technologist	1 No. @	900.00/Pm.
2.	Clerk-Cum-Typist	1 No. @	400.00/pm
3.	Supervisor.	1 No. @	450.00/pm
4.	Semi-skilled labour.	8 Nos.@	350.00/pm
5.	Unskilled.	1 No. @	300.00/pm

The annual expenditure over salaries and wages is expected to be Rs. 69,840 which includes 20% fringe benefits. For the planned annual production one Shift work is considered sufficiently

CHAPTER. D.

PROCESS TECHNOLOGY

General.

Of the several methods invented for the production rubber thread from latex the process of extrusion of compounded latex in to a coagulant bath is by far the most important. The advantages claimed are uniform size with indefinite length and a wide range from coarse to finer counts. The size of the thread is expressed as count which is defined as the number of threads that can be placed in close contact per inch length.

The process of production consists of a series of steps:

A. Creaming of preserved field latex to obtain 60% DRC and testing of latex.

B. Preparation of dispersions.

C. Compounding.

D. Maturation.

E. Straining and deareation.

F. Extrusion, Coagulation and Drying.

G. Vulcanising.

H. Inspection.

I. Packing and despatch.

Creaming and Testing of latex.

Creaming is the process to make up the DRC of preserved field latex from around 30% to 60%. This can be achieved by mixing a paste of creaming agent 0.3% by weight of dry rubber in Ammonia in to the latex in the creaming tank with slow stirring and allowing it to stand for 24-48 hours when low density rubber and high density serum separates in to two distinct layers. The serum containing nonrubber constituents is drained off. Serum may contain a small % of rubber the recovery of which can be made if necessary.

The creamed latex is then subjected to various tests before compounding.

1.	Total solid (minimum)	62%
2.	DRC (Minimum)	60%
3.	Coagulum content (Maximum)	0.8%
4.	Mechanical Stability (Minimum)	400
5.	Chemical stability (Minimum Seconds)	100, 85°C
6.	Tests for Copper and Manganese.	0.001% (Maximum)
7.	Ammonia content.	

Preparation of dispersions.

For efficient vulcanisation the particle size of additives to the latex should be as small as that of latex particle itself. Ball milling of ingredients with a dispersing agent can give excellent results provided ball milling principles such as volume filling in proper ratio with balls and ingredients and speed and time of running of mill are observed. Usually 24 to 48 hours running is required.

Compounding of latex.

Creamed latex is taken in the mixing tank and stabilised suitably with 10% KOH with slow stirring. Paraffin emulsion and dispersion are then added one after another or together as may be preferred and viscosity adjusted by adding water but maintaining DRC between 50-55%.

Maturation, Straining and deaeration.

For even coagulation and maximum wet gel strength the compound is to be matured for 12 to 16 hours . For low stability latex this may be avoided. Before starting extrusion the compound is subjected to deaeration for a definite period and then strained through fine stainless Steel net or nylon cloth

and viscosity checked using Ford_beaker.

Extrusion.

The most sensitive and key operation in thread production is extrusion in to the coagulant bath through cylindrical nozzles under constant hydrostatic head to give thread of indefinite length . Extrusion nozzles are of accurately dimensioned borosilicate glass capilaries which are fused in to wider glass delivery tubes. The bore size may vary from 0.5 to 1mm. It is possible to alter the diameter of the thread by varying the hydrostatic head and the pulling of the thread. Each nozzle is dimentionally the same, spaced closely, arranged parallel and connected to a common hydrostatic head. The coagulant bath is usually aqueous acetic or formic acid of 20-40% concentration. For smaller counts lower concentration longer bath is preferred. In practice a 15-30% acetic acid bath will be satisfactory. The exact size of the thread is dependent on several factors. The general formula for a circular cross section thread of diameter d, is

$$d = 22.15\, r^2 P_1 \sqrt{\frac{100\, h.s}{1.P2.Vn}}$$

Where

P1 and P2 densities of latex compound and that of thread respectively.

h = Pressure in Cm.

n = Viscosity in centipoises of the compound.

S = Fractional solid content.

V = The speed in cm/sec of the delivery of the thread.

The usual speed of extrusion is 30-70ft/min.

The strength of the acid bath should be maintained approximately constant by adding at known intervals known amount of acid. The thread emerging from the bath is led over a roller to a hot water leaching bath and passes over a roller (talc Dusting) which rotates at slightly higher speed than the former roller to facilitate a little stretching. From here the thread is allowed to enter a hot air chamber of gradient 70°C-130°C where it is allowed to vulcanise partially or fully.

A schematic diagram of latex thread production is shown in Annexure B1, flow diagram in B2, layout in B3 and a typical formulation in Annexure C.

IMPORTANT TECHNICAL TERMS.

1. Count. It is defined as the number of threads that can be placed side by side in close contact over one inch length.
2. Tensile Strength. It is the breaking load expressed as Kg/cm^2 or lb/sq.inch and is referred to the initial cross sectional area. This can be done by a tensile tester machine the rate of ~~xxxxxx~~ stretch being 6 mm/sec. and uniform. The desired value is 3-5 Kg./mm^2.
3. Elongation at break. This is the increase in length at break when stretched under the conditions prescribed and expressed as % to original length. The value desired is between 600-800%.

4. Modulus. Which is also known as green modulus is the load required to stretch a thread to a predetermined elongation usually 300% and is expressed in Kg/cm^2.
5. Schwartz Value. This is the average of tensile stresses at an elongation of 300% measured during extension and retraction of a massaged thread, expressed in Kg/cm^2.
6. Elongation set. It is the % of increase in length when it is stretched to a definite length usually 300% and released after 30 seconds, the increase in length being measured after one minute.

Besides there are several other tests like abrassion resistance, fatigue test, elongation under fixed load, ageing and heat-resistance, and special tests like wash test, weathering test, discolouration test etc. which may be taken up considering the end use of the product.

Quality control

Best quality is always welcome in all industrial production. But quality beyond certain level is very costly and shall affect economy of production. Therefore, for reasons of simple logic right quality, uniformity of quality and reliability are to be considered most important. This is achievable in thread production. A routine test of latex given under the head creaming and testing of latex is essential. The extrusion pressure, concentration of acid bath, depth of immersion of

capilaries, angle of capilaries to the bath, viscosity of compounded latex etc. should be ensured identical within tolerence every day. Tests on finished product is equally important.

Process loss.

Process loss is inevitable in many industrial production though % loss may vary depending on the process, type of product, process methods and other concomitant factors. Rubber thread is no exemption to this. Manufacturing though simple in principle is complicated and delicate in detail. A safe margin of about 5% loss on annual production is therefore accounted. Annual output for sales is 33,700 Kg. of thread.

Scrap and waste disposal.

No major problem is involved in this matter. Scrap can be sold at regular intervals to reclaimers or to other parties interested in its utilisation. The main waste is serum and disposal poses no problem.

CHAPTER. E.

SELLING AND DISTRIBUTION.

The product is one which is not in the open market for immediate purchase at present. The practice prevalent is entering into agreement a prospective producer and a customer on matters of price, quality and regularity of despatch and such other factors which are of importance to both the parties. This situation therefore, does not necessitate at the initial

stage of opening of sales depots. It is desired to fetch 3 or more reliable customers. The vast rail and road net work and several transportation agents reduces to nothing distribution work. The freight charge within the country is to the tune of 50 paise per Kg.

In the first stage of expansion opening of a sales depot at a major consuming centre and procurement of assistance of the Export PROMOTION COUNCIL or similar organisations that are constituted under the Central and State Governments are expected to be more benificial to help out export if desired.

CHAPTER. F.

CAPITAL REQUIREMENTS.

The total capital to be employed for the project is split in to Fixed Capital and working Capital.

(a) Fixed Capital.

This is the amount earmarked for purchase of land, building Construction procurement and installation of machinery and equipments etc. Expenditure on Office furniture and equipments also come under this head. Preliminary and Pre-operative expenses also form a part of fixed capital. The fixed assets are as given below.

FIXED CAPITAL

a)	Land and Building.	Rs. 74,000.00
b)	Other Fixed expenses. (Annexure D)	Rs. 57,650.00
c)	Pre-operative expenses.	Rs. 6,650.00
	Total.	Rs.1,38,300.00

(b) Working Capital.

Provision for working capital is to allocate sufficient fund for a definite period so that production is not with held for want of fund. For slow moving product span of period is more and less for fast moving items. Usually recommended period is three months and for this project also the same period is recognised. The major components of expenses are raw materials, salaries and wages, utilities, repairs and maintenance, Printing and Stationary, T.A. and D.A., Postage and other condigencies. Money is supposed and expected to come to circulation from sales of goods for the remaining period.

Three months requirement is summarised below.

		Rs.
(a)	Raw material.	94,125.00
(b)	Salaries and Wages.	17,460.00
(c)	Overheads.	8,415.00
	Total.	1,20,000.00

Details of working capital components are shown in Annexure E.

CHAPTER. G.

FINANCING PLAN.

Well thought out, logically concluded financial planning is a prerequisite in an industrial venture. This project, to start with requires a fixed capital investment of Rs.1,38,300.00

and a working capital of Rs. 1,20,000.00. The total investment works out to Rs. 2,58,300.00. Of this, Rs. 24,000 is planned to be met from own fund towards the cost of land and building and pre-operative expenses. That is, Rs. 17,350.00 which is nearly 23.5% on land and building and 100% of pre-operational expenses ie. Rs. 6,650.00. A total loan of Rs. 2,34,300 to cost rest of the fixed capital worth Rs.1,14,300 and Rs. 1,20,000 towards working capital is to be borrowed from financing institutions authorised in this behalf by the Central or State Governments or from Nationalised Banks. The rate of interest on Capital to borrowed for fixed assets may vary 7.5% - 9.5% and that for Working Capital from 12-16%. Payment of 9% interest on borrowed capital for fixed investment and 16% on working capital is estimated.

Interest Commitments.

1. Borrowed fixed Capital Rs. 1,14,300 @ 9% — Rs. 10,287.00

2. Borrowed working capital Rs. 1,20,000 @ 16%. — Rs. 19,200.00

CHAPTER. H.

PRICING POLICY.

The pricing of the product when introducing to the market should be done judiciously. Under-pricing and over-pricing both are undesirable even if the product is of good quality. Depending on the count a price of Rs. 17 - 20 per Kg. of thread is very common in the demestic market. A price of not less than Rs. 18 per Kg. is expected for 45-55 count thread.

When export is desired a crytical analysis of the market is necessary bearing in mind the heavy competition from synthetic thread. At present a price of Rs. 20-30 per Kg. is likely.

CHAPTER I

PROFITABILITY.

Taking in to account the compounding material that goess in to the rubber and a process loss of 5% of the total production, a total of 33,700 Kg of thread is expected to bring at the rate of Rs. 18 per Kg. a sales income of Rs. 6,06,600. Annual expenditure and income table is given in Annexure F.

(1) Rate of return on own Capital.

Own Capital.	Rs. 24,000.00
Profit.	Rs. 53,533.00
∴Rate of return.	2.23
% Rate of return.	223

(2) Rate of return on Capital Employed.

Total Capital employed.	Rs. 2,58,300.00
Profit.	Rs. 53,533.00
∴Return of return.	0.2072
% Rate of return.	20.72

(3) Percentage Profit on Sales turnover.

Annual Receipt from Sales.	Rs. 6,06,600.00
Annual Profit.	Rs. 53,533.00
% Profit on Sales turnover	8.816

CHAPTER. J.

ECONOMIC VIABILITY.

(1) Interest remitments

(a)	9% interest on term loan from K.F.C. (Fixed assets)	Rs. 10,287.00
(b)	16% on borrowed working Capital from Commercial Banks.	Rs. 19,200.00
	Total Commitments.	Rs. 29,487.00

(2) Ability to pay back borrowed fund.

The borrowed ~~fu~~ fixed capital is to be paid back with in the prescribed time. Quick pay back adds directly to the annual profit. From the annual profit 75% may be used to pay back the term loan and the remaining 25% retained.

(3) Pay back period.

(a)	Annual Profit.	Rs. 53,533.00
(b)	Depreciation.	Rs. 9,880.00
(c)	Available Surplus (a+b)	Rs. 63,413.00
(d)	Less 25% drawing.	Rs. 15,853.25
(e)	Amount available for repayment.	Rs. 47,559.75
(f)	Term loan to be paid back.	Rs.1,14,300.00
(g)	Pay back period.	2.397 years.

(4) Breakeven analysis.

For efficient running and dynamic management of the enterprise break-even analysis is helpful. It is that point of production at which the unit is neither on loss nor on profit. Each unit of product above this point brings profit where as fall of production

results in loss. Break-even is calculated from the formula,

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

Where BE = Break-even production/annum.

F = Fixed cost = (Total cost - Total variable cost)

P = Sales Income.

V = Total Variable cost.

Total cost.	Rs. 5,19,367.00
Total variable cost.	Rs. 4,80,000.00
Fixed Cost F.	Rs. 39,367.00
Sales income P	Rs. 6,06,600.00
∴ BE Production	31.1% ie. 10,500 Km/Annum.

The break-even production is around 1/3 of the planned production and hence the project is sound and safe.

CHAPTER. K.

SOCIAL BENEFITS.

Small Scale enterprises play a vital role in the country's growth and self reliance. It is a potential source of employment with minimum of Capital investment, yields profit to the entrepreneur, aids even distribution of national wealth and satisfy the potential demand of the country.

CHAPTER. L.

CONCLUSION

The scheme presented is a Small Scale one as per the definition. There is ample scope for expansion in the same line of production or with multiple products with small capital commitments. A slight improvement in process technology can give higher out put, Since the production is semicontinuous in nature. The project as such is sound, safe and prospectful.

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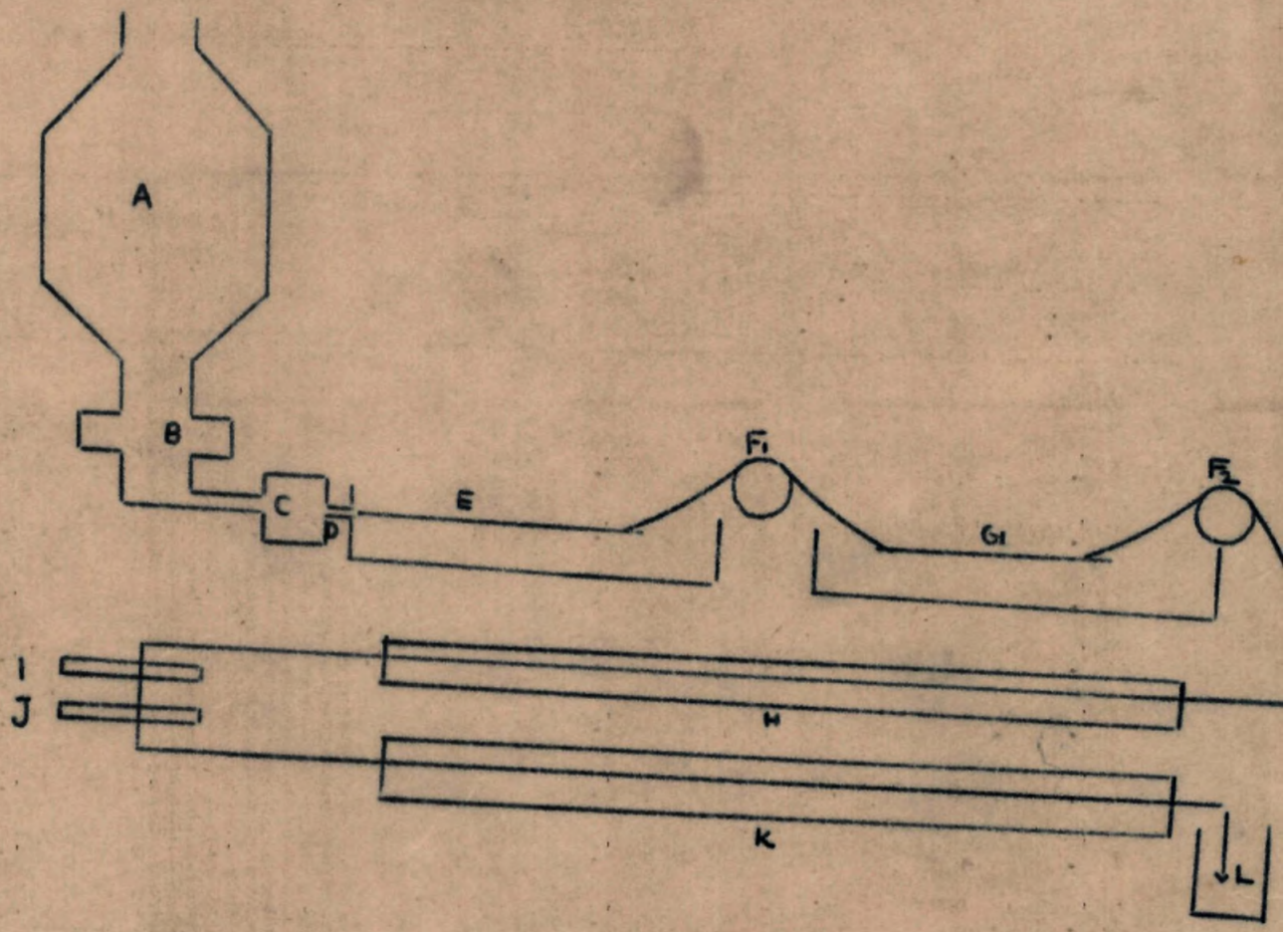
ANNEXURE. A.

LIST OF RAW MATERIALS AND CHEMICALS VIS-A-VIS PRICE, ANNUAL CONSUMPTION AND COST

Raw Material/ Chemicals.	Price/Kg Rs.	Annual Consumption. Kg.	Annual Cost Rs.
1. Preserved field latex Kg (DRC)	9.50	30,000	2,85,000.00
2. Zinc Oxide.	18.00	900	16,200.00
3. Sulphur.	2.00	540	1,080.00
4. Titanium Dioxide.	10.00	2,400	24,000.00
5. ZDC	33.50	60	2,010.00
6. ZMBT.	31.00	450	13,950.00
7. Paraffin.	2.50	360	900.00
8. Anti-oxidant.	25.00	450	11,250.00
9. Dispersing Agent.	30.00	240	7,200.00
10. KOH.	16.00	60	960.00
11. Colour.	60.00	60	3,600.00
12. Acetic acid.	10.00	450	4,500.00
13. Talc.	0.75	600	450.00
14. Creaming Agent.	60.00	90	5,400.00
	Total.		37,6500.00

ANNEXURE. B1

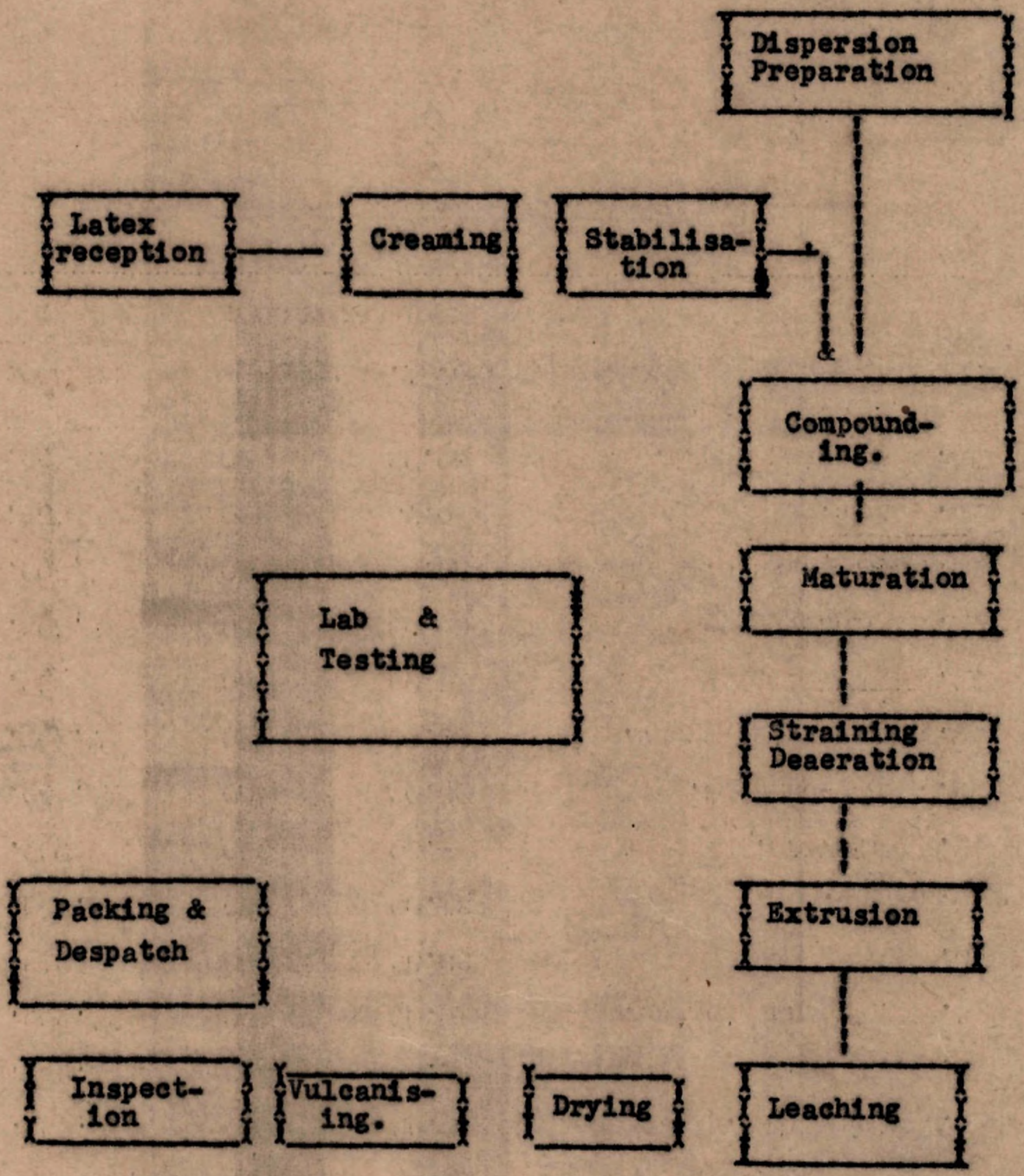
SCHEMATIC DIAGRAM OF LATEX EXTRUSION



A - Storage tank
B - Filter.
C - Flexible tube.
D - Glass Capilary.
E - Coagulating bath.
F_1, F_2 - Rollers.
G - Washing bath.
H - Drying Channel.
I - Dusting.
J - Tape forming.
K - Vulcanising Channel.
L - Collection.

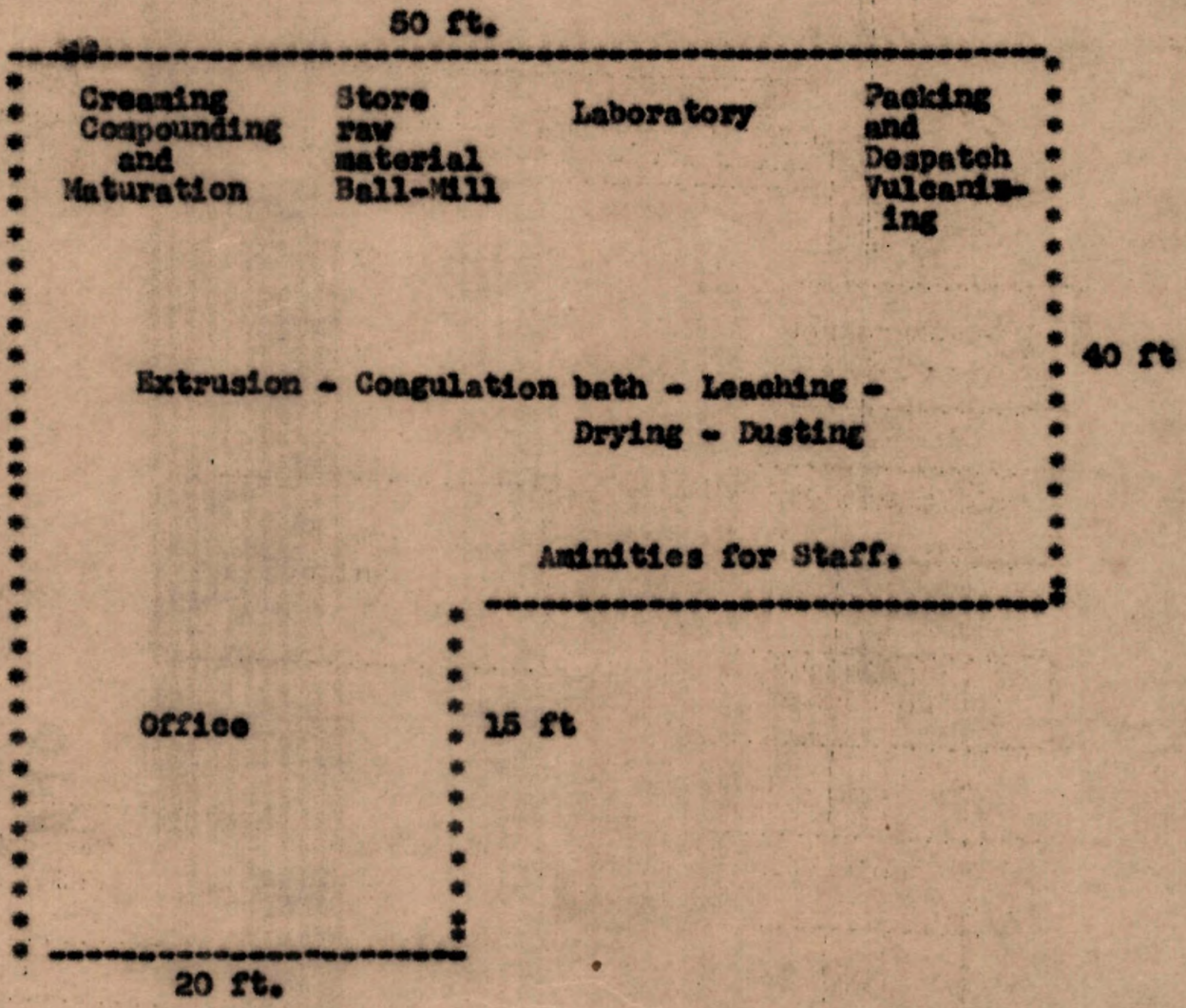
ANNEXURE B2

FLOW DIAGRAM FOR THREAD PRODUCTION



ANNEXURE B3

A TYPICAL LAY OUT



ANNEXURE. C.
TYPICAL FORMULATION

(a) Ball mill receipe

	gm/100gm of dry rubber.
Zinc Oxide Active	3.0
Titanium Dioxide RFK-D	8.0
ZMBT	1.5
ZDC	0.2
Sulphur	1.8
Colours	As required.
Dispersing Agent 5% Solution	15.5
	31.00

This gives a 50% dispersion of ingredients.

(b) Compound Receipe

	Wet	Dry
Natural latex	167 gm	100
Paraffin Emulsion 60%	2 gm	1.2
KOH. 10%	2 ml	0.2
Antioxidant SP Emulsion 50%	3 gm	1.5
Ball mill dispersion	31 gm	15.5
Distilled Water	Depending on the Viscosity desired.	

ANNEXURE. D.

DETAILS OF FIXED ASSETS

			Rs.
1.	Land 10,000 Sq.ft. at the rate of Rs. 0.5/- per Sq.ft.		5,000.00
2.	Built-up area 2300 Sq.ft. Rs. 30 per Sq.ft.		69,000.00
3.	Office equipments and furniture.		6,000.00
4.	Machinery and Equipments.		
(a)	Creaming tank Nos. 4		800.00
(b)	Compounding vessels Nos. 3		350.00
(c)	Storage and maturing tanks	Nos.4	500.00
(d)	Glass made extrusion tank	Nos. 3	1,500.00
(e)	Coagulation baths.	Nos. 2	10,000.00
(f)	Hot water washing bath	Nos. 2	1,500.00
(g)	Motor ½ H.P. 2 and 2 H.P.1	Nos. 3	5,000.00
(h)	Hot air tunnel.	Nos. 2	4,000.00
(i)	Ball mill Excluding motor.		1,000.00
(j)	Winding Equipments.		4,000.00
(k)	Vulcanising ovan.		5,000.00
(l)	Scales	Nos.3	8,000.00
(m)	Laboratory Equipments.		10,000.00
	Total.		1,31,650.00

ANNEXURE. E.

DETAILS OF WORKING CAPITAL

		Rs.
(a)	Raw Material.	94,125.00
(b)	Salary and Wages.	17,460.00
(c)	Other overheads.	
	Repair and maintenance.	2,000.00
	Utilities.	400.00
	Printing and Stationary.	865.00
	T.A. and D.A.	4,000.00
	Postage and telephone.	250.00
	Other condigencies.	900.00
	Total.	1,20,000.00

ANNEXURE F

TABLE SHOWING ANNUAL EXPENDITURE AND INCOME

EXPENDITURE

		Rs.
A.	Cost of raw materials (Annexure A)	3,76,500.00
B.	Salary and Wages.	69,840.00
C.	Other overheads.	
	1. Repair and maintenance.	8,000.00
	2. Utilities.	1,600.00
	3. Printing and Stationary.	3,460.00
	4. T.A. and D.A.	16,000.00
	5. Postage, telephone and telegram.	1,000.00
	6. Other condigencies.	3,600.00
D.	Depreciation on building @ 5%	3,450.00
E.	Depreciation on fixed assets including preoperative Expense @ 10%	6,430.00
F.	Interest on borrowed term loan (Fixed Asset)	10,287.00
G.	Interest on working Capital @ 16%	19,200.00
H.	Packing and despatch @ 50 Paise Kg.	16,850.00
I.	Freight charges @ 50 paise Kg.	16,850.00

INCOME

Income from Sales of 33700 Kg. of thread Rs. 18 per Kg.	Rs. 6,06,600.00	
Excess over expenditure (Profit)		53,533.00
Total.	Rs. 6,06,600.00	6,06,600.00