PROJECT REPORT ON

FOAM BACKED

COIR CARPET

MANUFACTURING UNIT

SUBMITTED TO THE UNIVERSITY OF COCHIN

IN PARTIAL FULFILMENT OF

BACHELOR OF TECHNOLOGY DEGREE COURSE IN

POLYMER SCIENCE AND RUBBER TECHNOLOGY

By

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Cochin-22,
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SECTION-A

INTRODUCTION

Coir combines beauty with utility and provide a rhythmic vitality to the rural economy of Kerala. Coir offers a multitude of imaginative alternatives in mats, mattings, carpets etc. Coir carpets are lush and lovely. They are crush proof and bounce back with verve. They are easily cleaned and moth proof.

Latex foam backing on these carpets provide an attached cushion for the carpet. It supports the carpets, improves the wear and service life of the product, storage and installation become easy, good insulation for sound and heat, good resilience, improves the stiffness, good creasing resistance and fraying resistance when trimmed and gives nonslippery charactor. So foam backing is a must for getting an increased carpet life.

Coir products earn for our country foreign exchange to the tune of Rs.25 crores every year. It provides employment to more than 5 lakh people of the densely populated coastel belt of Kerala. Of the total production of coconuts, more than 60% is from Kerala itself.

India has recently started in a small way the production of foam backed carpets. This is in the infant stage and has very good scope in the future. The market analysis given

in the project is based on the thorough survey in various parts of the world. Project includes the requirement and availability of raw materials and other production requirements, process of manufacture and the financial sources etc.

A.1. History and Main object of the Project:-

The carpet industry continues to show a high growth rate as the demand for soft floor coverings increases. Many cities become known as "Capital" of a certain industry. Pitsburgh has been called as "Steel Capital" and Akron is the "rubber capital". A newcomer to this list is Dalton. Dalton is known as the "Carpet Capital" of the world.

In 1895, a young girl named Catherine Evan began making bed spreads by sewing a locked stitch in fabric and leaving the loose ends to show. Her stitch resembled a "tuft" of grass. Although catherine's tufting technique become very popular and there was wide spread demand for her products.

Tufting did not make its impact on the carpet industry until the 1950's when machine capability was expanded to handle goods 12 ft. wide. Carpet manufacturers were eager to switch over their mills to the tufting process from the traditional weaving methods.

In the early days of carpet making, 90% of the carpet manufactured was woven and only 10% tufted. After some 25 years these figures become 12% and 88% respectively.

Tufting remained a hand manufactured craft until 1930's when a machine was developed for tufting.

The desire to make carpeting even more financially available led to the introduction of latex foam as a carpet backing in 1950's. A layer of foam padding is applied directly to the carpet and becomes an integral part of the total structure. The installer does not have to lay an area of padding and then a layer of carpeting. Two actions are combined into one, with foam backed carpeting. The first company to begin applying liquid latex foam to the back of carpet was the "Dalton Carpet Backing Co.".

Over the past few years foam backing of tufted carpets increased by 20 to 25% per year and this application now consumes more latex. The carpet industry has experienced major changes since the advent of tufted carpets. About 20 years ago most os the carpet produced were woven, making use of traditional methods and skills developed over centuries of craftsmanship.

India has an established century old coir matting industry. West European Countries have lately emerged as a competitors in this field with fully mechanical looms for making carpets, rugs, mattings etc. Other countries such as Philipines, Kenya, Tanzania and Burma have already started the mechanical extraction of coir fibre for their local industry.

Main object of the project:-

Having assured an abundant supply of both the raw materials required for the carpet backing industry, there is promising potential to manufacture and export foam backed coir carpets rather than trying to export these materials separately. By this we can eliminate stagnation in the agricultural sector in Kerala and also it will increase the value added in export.

Coconut and Rubber are the two major agricultural crops of Kerala and more than 70% of population depend on these products. Expansion of market and modernisation of this field is one of the urgent needs of the state. Kerala State Coir Corporation is set up with the objective of stabilising the coir industry in Kerala and to function as an export house for coir and coir products manufactured by small producers scattered over Kerala.

By the foam backing process, storage and installation become easy. Given these advantages together with improved wear, insulation and comfort it is not surprising that the majority of tufted carpeting on sale today is foam backed. Foam backing has increased at a rate of 20 - 25% per year.

To conserve energy and at the same time provide a luxurious working environment carpet should be considered as a primary building material. According to tests conducted

by Kansas State University and Carpet & Rug Institute, carpeting can reduce the heating cost of a standard room by 5 - 13%. Attached latex foam, being cellular in structure, with many dead air spaces, is an excellent insulating material. This means even greater fuel economies can be obtained with an attached latex foam cushion.

To provide maximum sound conditioning for an office or library, carpeting should be installed with a cellular under layment such as attached latex foam. According to testing conducted by Kodaras Accoustical Lab. and Carpet & Rug institute, carpeting installed with a latex foam padding over a concrete floor has a noise impact rating of +28 compared to a direct glue down installation over the same floor with a noise impact rating of +14.

A.2. Product description:-

Carpets usually divided into three types:-

1. Woven carpets.
2. Needle punched carpets.
3. Tufted carpets.

The traditional method of manufacture gives woven carpets. These are high quality products which when preperly laid with a suitable underlay (foam backing) gives a life time of service. Latex is used in the back sizing of carpets, in secondary backing and in foam backing. The last one has become a major growth area - the majority of tufted carpeting

for sale in Western Europe today is foam backed. Natural rubber latex is most suitable for all carpet backing application.

There are different kinds of latex foam for carpets depending upon the thickness and amount of rubber, filler or air in the foam. Almost any type of carpeting can have an attached high density latex foam backing. Recently printed carpets have enjoyed an increase in popularity due to design flexibility and improvements in the printing process. Latex foam used for backing these carpets consist of a network of open at or inter connecting cells which may be subjected to large repeated deformation without damage. It has a porous surface skin, allowing it to breathe readily.

Latex foam is available in flat and embossed rubber backing. Both are suitable for outdoor installation. There are two techniques for producing flat foam backings on carpets. Gel process in which the foamed latex compound is applied to the carpet, gelled, then dried and vulcanised. In the non-gel process, foam compound is applied to the carpet and passed directly to the oven without going through a gelling stage. Embossed foam backing are made by the gel process.

This project is for making flat foam rubber backing and the gelled foam process is employed. The economics of this project are very attractive, it will run at a profit from the very first year itself.

A.3. Evaluation of Prospects:-

The demand for the carpet backed with latex foam is increasing steadily and units producing this are working hard to meet the demand in home and outside market. Though specific information on the capacity and production of these products are not available, based on the export market, it is clear that there is very good demand for this product. Also ever increasing growth of star hotels, cinema theatres and such places presents a good demand for foam backed carpets.

Foam backed carpet is an excellent choice for a basement recreation or hobby room. It can be installed directly over a concrete or tile floor if the basement is normally dry. Foam backed coir carpets can be installed without additional floor preparation over plywood, poured concrete, vinyl tile and many other roughly finished floors.

There is no need to sand or grind the floor to a smooth finish as required for direct glue-down installation. The foam backed carpet will absorb the impact from the high points in the roughly finished floor without resulting in extra ordinary wear.

It is an export oriented product and it provides continuous employment to weavers of coir matting in cottage industry and to meet the changing demand of a sophisticated export market. Foam backed carpets also find good demands in hotels, theatres, studios, palaces etc.

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SECTION-B

MARKET SURVEY

B.1. Users/Customers analysis:-

The world output of rubberised coir products is estimated at 60,000 tonnes/year bulk of the production is geared to meet the requirement of automobile industry. A new and fast expanding market for rubberised coir is the foam backed wall to wall mattings popular in European market. On the average 10% of the coir products exported from India accounts for carpets and rug.

The consumption of latex for foam and its percentage to total consumption for last five years is given in the table. It shows that, total consumption of ta latex for foam products is increasing year to year.

Table-1. Latex consumption and its percentage to total consumption:

Year	Total consumption (MT)	Latex consumption DRC (MT)	Percentage
1973-74	130302	7846	6.02
74-75	132604	7453	5.62
75-76	125692	6352	5.05
76-77	137623	8497	6.17
77-78	144969	9033	6.23
78-79	164524	10960	6.66

Source:- Indian Rubber Statistics - 1980.

Table-2: Consumption of latex for foam manufacture.

Year	Total consumption DRC (MT)	Latex consumption for foam DRC (MT)	Percentage consumption
1973-74	7846	3457	44.06
74-75	7453	2796	37.51
75-76	6352	2033	32.00
76-77	8497	2238	26.33
77-78	9033	2653	29.37
78-79	10960	3543	32.32

Source:- Indian Rubber Statistics - 1980.

This product is find an extensive market in home market and outside the country. In home market, the major consumers are Cinema theatres, Studios, Hotels, Palaces and Houses. Almost all the 'A' grade theatres are decorated with foam backed carpets. These theatres are coming up at a fast rate. So consumption of this product also increase. Same is the case in Star Hotels and palaces. Now the standard of living is increasing so the demand for this product increases in houses also.

B.2. Assessment of future demand:-

Total market for foam backed carpet is estimated at 10.0 million square metre. Annual growth rate of market is estimated at 5 to 10% from country to country. There are

obvious indications of steep increase in demand for this product. Now India Government is giving more promotional effect for exporters of rubber goods. So we can expect a bright future for the foam backed carpet in India and outside the country. The following table gives the estimates of future demand in various countries.

Table-3: Market details for foam backed carpets:

Country	Requirement in million square meter
Denmark	0.8
Sweeden	1.3
Norway	0.4
Holland, W.Germany, Italy, Switzerland	2.5
U.K., U.S.A., Canada, U.S.S.R.	4.6
India	0.4
Total	10.0

Source:- Kitco, Ernakulam.

B.3. Export Possibilities:-

This foam backed carpets has a very good export possibilities. Coir carpets constitute 6% of Indian global export of finished products of coir. The trend of export of coir carpets during the past five years was as indicated in table-4.

Table-4. Export of Coir Carpet

Year	Quantity (Tonne)	Value (Lakh Rs.)
1974-75	1451	83.53
75-76	1841	120.47
76-77	959	69.89
77-78	1228	99.32
78-79	1298	100.35

Source:- Statistical bulletin of coir board - 1979-80.

It shows that export of carpets is increasing year to year. So we can expect the same export possibility for foam backed carpets also.

In 1978-79, West European countries accounted for 68% of the total volume of export of coir products from India. Next come America with a share of 17% in the total volume of export from India during 78-79. East European countries shared only 7% of Indian global export of coir products during the year. This is given in Appendix - I.

There is a better scope for exporting the Indian Coir carpets backed with foam. The market is now expanding to

almost all the African countries also. So we can expect a better export chances for these carpets in the coming years.

East European countries served to both major buyers of coir products till 73-74. But the year 74-75 witnessed a sudden change in trend, when West Europe emerged on a major buyer. Of late, considerable interest is also shown by USSR in Indian coir carpets and it is expected that considerable off-take will materialise in the years ahead. Export of coir rug & carpets to USA & Canada is fast picking up and a promising market is predicted for these product in these countries.

In 1976, production of coir and coir products were estimated to be 1,55,000 tonnes. Internal market in India consumed 1,02,917 tonnes and exported 44,421 tonnes valued Rs.229.65 million. An increasing trend of interest in and demand for coir products is in evidence in the international market today. It should be our endeavour to exploit this trent to the maximum extent possible.

Annual average export of coir mats, mattings and carpets from all exporting countries during the period 1974-1978 amounted to 24,700 tonnes and of this 16,400 tonnes originated from India. In other words, India hold a share of over 66% in the global trade in finished products of coir.

Principal buyers of coir products are UK, USA, W.Germany, Italy, France, Australia and Netherland. All the world over the demand for floor coverings during recent years

has witnessed rapid increases owing to the high rate of consumption of new dwelling and the use of floor covering for non-residential purposes.

Our export of rug and carpets during 1979-80 was 1320 tonnes worth 1.32 crores where as it was 1199 tonnes valued at 1 crore during 78-79. There was a marginal increase in the export of coir rugs and carpets during the year 1979-80.

The table 5 & 6 explain the region wise share of exports of coir products and composition of export during 78-79.

Table-5. Composition of export 1978-79.

Item	Quantity (% share)	Value (% share)
Coir yarn	53	35
Coir Mats	25	38
Coir carpets & rugs	19	26
Others	3	1
Total	100	100

Source:- Statistical Bullentin of Coir Board, Ernakulam.

Table-6. Region-wise share of export - 1978-79.

Region	Share
W.Europe	68
E.Europe	7
America	17
W.Asia	3
E. Asia	4
Africa	1
Total	100

Source:- Statistical Bulletin of Coir Board - 79-80.

The export potential of this product is high. Country wise export of Rugs and Carpets from India during 78-79 and 79-80 are given in Appendix - II. It shows that market is expanded at higher rate.

So the export of coir carpets are increasing year to year. So if we are trying to export this foam backed carpet, we can catch the whole market in the world. The following table (7) shows the unit value of export.

Table-7: FOB Value of export of coir products - during the past 5 years

Item	74-75	75-76	76-77	77-78	78-79
Coir Mats	571.06	751.14	766.91	771.42	825.98
Mattings	497.08	630.8	646.6	774.2	799.8
Rugs & carpets	575.5	654.2	726.59	808.9	837.2

Source:- Coir House - Ernakulam.

B-3 Conclusion:-

Market for coir carpets backed with foam can be maintained if coir producing countries, especially India, take immediate step for production and sales are backed with adequate promotional effort of items of floor coverings for which there is already a developed market in the exporting countries.

Against the above back ground, this project will help the developing of a wide range of coir floor furnishings so as to make modification in the product mix and production

programme depending on market condition obtaining from time to time.

Although there is no developed domestic market, there is need for developing domestic market mainly to serve as an effective cushion to any changes in the international market condition. Domestic population of a size of 30 million is of comparable standards to the end users of coir products in European countries, also could be developed as a prospective market for sophisticated coir products in India as well.

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SECTION-C

PRODUCTION REQUIREMENTS

C.1. LOCATION:-

Details of location of the plant is very important. Location has a considerable influence on operating cost and productivity.

When selecting the site for the factory the following factors are to be considered.

a. Availability of raw materials.

b. Availability of skilled and unskilled workers.

c. Availability of power & water.

d. Availability of communication facilities.

e. Facility for transporting goods by rail/road & water.

The present unit is proposed to be located in an industrially backward area like Alleppey, where the major coir carpet manufactures are concentrated. Also National highway is touching this district. Water transport is also easier here. Following are the other advantages for locating a unit in an industrially backward area:-

1. Availability of land at cheaper rate.

2. Reduced overhead expenses.

3. Availability of cheap labour.

4. No delay in getting water supply, power connection etc.

C-2. PLANT LAYOUT:-

In order to keep the operating cost at the minimum, the following factors should be taken into account in determine

the layout of the plant.

i) Rooms for further expansion.

ii) Material handling should be minimum

iii) Ensure an easy flow of materials through the factory.

Layout of the plant is shown in Appendix - IV.

C.3. LAND AND BUILDING:-

C.3.1. LAND:- Land should be fairly even. Total land required is estimated as 5000 sq.ft. considering the future expansion. The cost of 5000 sq.ft. of land works out to be Rs.15000/=

C.3.2. BUILDING:-

The requirement of built up area is estimated by considering the following points:-

1. The expansion programme in future.
2. The minimum area required for machineries.
3. Layout of the plant.
4. Space to be provided for keeping the maximum amount of inprocess inventories.
5. Space to be provided for keeping the finished goods and Raw materials.

Based on these consideration the following areas are adopted for the specified section. Total area is estimated as 4800 sq.ft. Details of land and building is given in Annexure - I - 1.

1.	Raw material storage	-	700 sq.ft.
2.	Chemical storage	-	250 sq.ft.
3.	Ball mill	-	200 sq.ft.
4.	Foaming area	-	600 sq.ft.
5.	Foam backing area	-	800 sq.ft.
6.	Boiler	-	100 sq.ft.
7.	Drier	-	900 sq.ft.
8.	Inspection & packing	-	300 sq.ft.
9.	Finished product storage	-	700 sq.ft.
10.	Administrative office	-	150 sq.ft.
11.	Toilet and other facilities	-	100 sq.ft.
	Total	-	4800 sq.ft.

C.4. REQUIREMENTS OF MAIN RAW MATERIALS:-

Total estimated production per annum is 2,88,000 sq.meter of foam backed coir carpet.

The important raw materials required for the project are:-

1. 60% Centrifuged natural rubber latex.
2. Coir carpet
3. Sulphur.
4. Zinc mercapto benzo thiazole (ZMBT)
5. Zinc diethyl dithio carbamate (ZDC)
6. Zinc oxide.
7. Sodium silico fluoride.
8. Soft clay.
9. Antioxident - Accinox SP

Requirement of each items are discussed in the following paragraphs.

1. 60% Centrifuged natural rubber latex:-

The annual requirement of latex is 143040 kg (DRC). 60% latex is available from the local manufacturers. The suppliers of these raw material are given in the Appendix VI.

2. Coir carpet:- Total required per annum is 288000 sq.meter. It is also available from the local manufacturers at the rate of Rs.16/-sq.meter. So total cost comes to be about Rs. Rs.46,08000/=

Sulphur:- Sulphur is used as the vulcanising agent and the requirement per annum is 3570 kg.

4. Z.M.B.T. and Z.D.C. These are the accelerators used for the vulcanisation of the foam. Annual requirement is 1068 kg and 1425 kg. respectively.

5. Zinc oxide:- It is the activator for nr vulcanisation and white seal grade is used for foam rubber production. The per annum requirement is 4290 kg.

6. Sodium Silico fluoride:- This is the gelling agent used in the manufacture of foam rubber. The annual requirement would be 1428 kg.

7. Aquinox SP:- This is the antioxidant used in the foam rubber production. The per annum requirement is 1425 kg.

8. Soft clay:- This is the filler used for reducing the cost of production. Annual requirement is 21420 kg.

The annual consumption and cost of all raw materials are listed in Annexure - II-1. The list of suppliers of raw material is given in Appendix-VI. The value of annual requirement of raw material and packing material is worked out to be Rs.76,76,800.00

Terms of purchase of Raw Materials:-

All negotiations related to purchase of raw materials are done through bank on a margin money of 15%. The Industrial development Bank (IDB) will advance 85% for the purchasing of materials in an industrially backward area.

C.5. MACHINERY AND EQUIPMENTS:-

The selection of machinery is most important since maximum utilisation of machinery gives better return for the money spent. The selection of each machinery is based on some considerations.

a. Estimated capacity.

b. Type of Production.

c. Its effect on utilization of all machinery.

Based on these considerations the following machineries are selected for production of 960 sq.meter of foam backed carpet/day.

C.5.1. Planetary Mixer:- Capacity of the mixer should be 100 litre and two numbers are required. Each one is equipped with 3 HP motor. Speed of the planetary and beater is 25 and 75 r.p.m. at slow speed and 50 & 150 r.p.m. at high speed respectively.

C.5.2. Deammoniation tank:-

It should be fitted with a stirrer and capacity is 200 litre. 2 deammonial tanks are required and each one has 1 HP motor.

C.5.3. Ballmill and Emulsifier:-

Ball mill of 5 jars of capacity each jar being 20 kg. Balls of diameter 3"&equipped with 2 HP motor. Two Ballmill are required for the required production.

C.5.4. Boiler:- Vertical, cross tube boiler of 100 kg/hr capacity and equipped with a motor of 3 HP for pumping water.

C.5.5. Compounding tank:-

Equipped with a stirrer of 0.5 HP motor.

C.5.6. Spreader:- It is used for spreading the foam to the carpet.

C.5.7. Drier:- Drier is used for vulcanising the foam backed carpets. Conveyor system is used for carrying the carpet into the drier.

C.5.8. Platform balance:- of 200 kg capacity.

C.5.9. Let off & wind up arrangement:- It is used for feeding the carpet for backing and winding backed carpet.

The details of machinery and equipment is given in Annexure - I-2.

The list of manufacturers of machinery is given in Appendix - VII.

Terms of purchase of machinery:-

Quotations are invited and orders are finalised for the satisfactory ones. The quoted prices may be exclusive of packing charges, transportation charge, insurance, sabetax etc. The delivery period for the major item will be 2to 4 months. 40% of the price must be advanced at the time of finalising the order and the balance after inspection of machinery at the factory. The conditions are liable to change due to unforseen reason.

C.6. MAN POWER REQUIREMENTS:-

The total man power requirements are classified under the following heads:-

1. Administrative staff.
2. Technical Staff.
3. Labours.

The total number of factory personnel required is 49. Out of these, 36 are labours and it include 12 skilled, 7 semiskilled and 15 unskilled labours. The total annual cost towards salaries and wages worked out to be Rs.34,2540/-

The details of man power requirements and salaries are given in Annexure - II-2-2-

C.6.1. Administrative Staff:- The head of the administrative staff is the Works Manager who handles the over all management of the factory. He should have a basic degree in Business Administration with minimum 5 years experience in top management

level. He should be versatile talented and dynamic.

C.6.2. Technical Staff:- Technical manager controls the technical problem. He should have a basic degree in Rubber Technology. There are two production supervisors and one technical assistant under the technical manager.

C.6.3. Labour requirement:- They are actually involved directly in the production operation. They are classified as skilled, semiskilled and unskilled labours. Details of man power requirement in each section is given below:-

Job description	Number of labours/day		
	Skilled	Semiskilled	Unskilled
1. Compounding section	2	2	--
2. Foaming Section	4	-	3
3. Backing area	4	1	2
4. Drier area	1	1	-
5. Boiler	1	-	-
6. Let-off side	-	1	1
7. Wind-up side	-	-	2
8. Packing & despatch	-	2	3
9. Stores	-	-	2
10. Finished product store	-	-	4
Total	12	7	17

C.6.4. Training Programme:-

Skilled labours and semiskilled labours can acquire the processing methods from Rubber Research Institute of India, Kottayam.

C.7. UTILITIES:-

The Utility required for the plant are water, steam and electricity. The requirement of these utilities are given below:-

C.7.1. Steam:-

Steam required/hour = 50 kg

Daily consumption comes to about 450 kg. Assuming 300 days, steam required per annum = 135000 kg.

steam production/litre of oil = 10 kg.

Total oil consumption/annum = 13500 litre.

cost of fuel per annum at the rate of Rs.2.40/litre

= Rs.32,400.00

C.7.2. Water:-

This unit requires water for boiler, compounding and for personnel use.

1. Water consumed by boiler = 2000 litre.
2. Water consumed in processing = 3000 litre.
3. water required for personnel use= 4000 litre.

Total = 9000 litre

Cost of water /annum @ Rs.1/kilolitre = Rs.2700/=

C.7.3. Power requirement:-

Electricity is the main source of power. Power requirement is calculated to be 50 H.P.

So power consumed per hour	=	37.3 KWh.
Total power consumption/day	=	300 KWh.
Power consumption/annum	=	90000 KWh
Power cost @ Rs.0.17/KWh per annum	=	Rs.15,300.00

Total cost of utilities are given in Annexure-II-2-1.

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SECTION-D

DESCRIPTION OF PROCESS OF MANUFACTURE

In this, foaming of the latex is done by mechanical incorporation of air into a suitably compounded latex, followed by the addion of gelling agent. This foam is spread to the back side of the carpet and thickness is adjusted with the doctor blade. Then it is gelled and vulcanized in the drier. Then it is tested for any defects and packed.

D-1-1. Foaming:-

The latex obtained from the suppliers is de-ammoniated to 0.22% in the deammoniation tank to improve the processing characterestics. Since most of the ingredients are in-soluble in water, it is necessary for these to be prepared as aqueous dispersions or emulsions for addition to latex. Dispersions are prepared by ball milling the ingredients in presence of a dispersing agent (Belloid TD) and water. Emulsions of liquid are prepared using high speed mix stirrers. Water soluble ingredients are added as solutions. Typical formulation for the preparation of dispersion and emulsions are given below:-

Accelerators:- ZDC and ZMBT are insoluble in water, it is added as 50% dispersions. It is ball milled minimum of 16 hrs.

	Parts by weight
Accelerator	50
Belloid T.D.	1
Soft water	49

Sulphur:- It is also added as 50% disperson.

	Parts by weight
Sulphur	50
Belloid T.D.	1
Soft Water	49

It should be ball milled for minimum of 48 hrs.

Accinox S.P. :- It is added in 50% emulsion

Nonox S.P.	100	A
Oleic Acid	5	
Ammonia	5	B
Water	90	

Part A is warmed to 75°C and B is added using high speed stirrer.

Fillers:- Filler used is soft clay. It is added as aqueous slurries by stirring the clay with water and despersing agent.

	Parts by weight
Clay	100
Belloid T.D.	2
soft water	40

Zinc oxide :-It is added as a 50% dispersion. It acts as an activator & auxilliary gelling agent.

	Parts by weight
Zinc Oxide	50
Belloid T.D.	1
Water	49

It is ball milled for 16 hrs.

Sodium Silico fluoride:- It is soluble in water and prepared as a 50% solution and diluted to 20% before use.

	Parts by weight
Sodium Silico fluride	50
Soft water	50

The latex is compounded with frothing agent, curing agent, accelerator, antioxidant etc. accoring to the typical formulation given in Appendix V. It is done in the compounding tank fitted with a slow speed stirrer. After compounding it is matured for 16 hours with slow speed stirring at 30°C. After that, filler is added and then it is ready for foaming. Usually 6 times of expansionis given during foaming.

Foaming is carried out in the foam mixer consisting of a bowl and stirrer which can be rotate at three different speeds. The initial foaming is carried out at high speed;

When the foam is approaching the final volume the speed is reduced to medium rate. Just before the required volume is reached Zinc oxide dispersion is added. Stirring is continued for 40 to 50 seconds and speed of mixer is reduced to refine the foam and sodium silico fluoride is slowly aided. Now the foam is ready for backing the carpet.

D.1.2. Foam Backing Operation:-

The carpet is let-off from the reel through the conveyor and latex foam produced is quickly transferred and spread uniformly to the required length and width. Then a doctor blade is used to get the specific thickness of the foam. Then the foam is allowed to get and it is then vulcanised in the drier set at 120 - 130°C for 25 to 30 minutes.

D.1.3. Finishing and Inspection:-

After vulcanisation, the products are trimmed and examined for any defects. Products are then tested according to the specifications.

Flow diagram for the process is given in the Appendix-III.

Foam backing confer the following properties. Improved appearance, luxurious walk and feel, improved wear resistance, added heat & sound insulation, non skid properties etc. Natural rubber latex is the most suitable one for carpet backing. NR showed its superiority in tensile strength, elongation break, tear strength, maximum resilience and minimum hysteresis loss. The compression set properties showed good results for NR, which also give wet & dry

delamination strength.

D.1.4. Precautions:-

Mixes based on natural rubber latex are easily prepared but certain precautions must be observed in order to ensure maximum stability of the mix.

D.1.4.1. Latex homogenisation and storage:-

Drums of latex should be agitated to homogenise the contents before compounding begins. Bulk tanks can be stirred witha large slow moving stirrer blade, and drums should be rolled to get homogenity. It should be stored in covered vessels to prevent the loss of ammonia.

D.1.4.2. Compounding:-

The latex in the compounding tank should be compounded with surface active agent before the addition of fillers, curatives & thickners. The use of high speed stirring should be avoided. Mixing is carried out with multibladed turbine stirrers operating at relatively low speeds in baffled vessels.

D.1.4.3. Straining:- The mix should be strained after mixing, before use in the carpet backing line.

D.2. QUALITY CONTROL AND SPECIFICATION:

The carpet industry is very competitive and cost conscious, so the choice of polymer is largely determined by economic consideration rather than processing or performance in service. There are some specifications exist in United states & U.K. to test whether the product is confirming the specification.

A subjective evaluation of carpet backed with foam can be done as follows:-

D.2.1. "Rub it":- Drag the thumb or finger briskly across the surface. The latex foam cushion should not tear or peel back.

D.2.2. "Bend it":- Bend the carpet double with the latex foam on the outside. The surface should not crack or tear.

D.2.3. "Feel it":- Press the thumb into the foam backing or pinch the carpet between the thumb and fore finger. If we can feel the rows of tufts through the foam backing, then the foam is likely to be lower in density than is recommended.

Following are the important tests done for the foam backed carpets. All the samples were matured for 24 hrs. before testing at 29°C and R.H. 60%.

Density:- The density is determined by weighing a 10 cm square and measuring the height with the ~~skk~~ thickeness gauge.

Tensile Properties:- Dumb-bells are cut from slabs of foam and tested for strength, extension modulus and elongation break.

Compression set:- Comparison of loss in thickness from the original thickness due to compression of form for a standard period of time. It is an indication of the ability of the foam to ~~retain~~ return to the original thickness after release of load, such as chair or desk legs.

Samples were compressed to 50% of original height and the set measured after three days at 20°C & 22hrs. at 70°C allowing 60 minute relaxation.

Resilience:- The samples were plied four high and a steel ball of 12 mm diameter allowed to fall from 100 cm on to the foam rubber. The rebound is measured and used to express the percentage resilience.

Accelerated Ageing:- Heat ageing - 24 hours at 275°F. After flexing, samples should remain flexible and serviceable.

Tear strength:- is determined using a 15 x 5 cm unsupported sample. These are the main tests done for the foam backed carpets.

D.3. Effluent Disposal:-

There is no liquid effluent from this factory. Only two gases coming out from the factory are carbon dioxide from the boiler and water vapour from vulcaniser. So provision should be given for let-off the gases high in atmosphere through chimney.

D.4. Process loss:- Perfect elimination of the process loss is very difficult. So we should minimises the process loss as far as possible by adjusting the batch weight, careful handling etc.

D.5. Waste Disposal:- The waste foam & foam backing carpets may occur due to careless handling. This can be sold as a low quality product at cheaper rates.

D.6. Product Diversification:-

Further product diversification is possible in this unit. Same machinery and equipment can be used for latex foam backing of all types of carpets like nylon, woolen etc.

SECTION - E

SELLING AND DISTRIBUTION

E.1. Method of Pricing:-

The important strategies of pricing are cost oriented pricing, demand oriented pricing and competition oriented pricing. For foam backed carpets cost oriented pricing is more relevant. The price of the foam backed carpet is fixed as Rs. 54/sq.meter in domestic market.

For exporting the product, the rate is inclusive of freight and other such charges. We can quote our price as F.O.B. Cochin Port.also.

E.2. Selling and distribution arrangement:-

Foam backed carpet can be sold through sales representative and dealers on a commission basis in home market. Distribution of this product to other states can be done through train or lorries.

Export Promotion Council:-

Export Promotion Council is set up to promote the export possibilities of various products in foreign countries. "Chemicals and Allied products export promotion council"is handling the rubber products. We can apply for the membership and they will help to find out market for our product.

We can send the products through ships to various countries. Address of the Council is given below:-

Chemicals & Allied Products Export
Promotion Council,
"World Trade Centre",
Eastern Region,
14/1-B, EZRA STREET,
4th Floor,
Calcutta - 700 001.

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SECTION F

CAPITAL REQUIREMENTS

The financial aspects of the firm can be given in the following heads:-

1. Fixed capital requirements.
2. Working capital requirements.
3. Gross capital requirement.
4. Total manufacturing cost.

F-1. Fixed Capital requirement:-

It is the sum of the expences incurred for plant, machinery, land & building and pre-operative expences. The estimated fixed capital requirement in the above heads are as follows:-

1.	Land	- Rs.	14,000.00
2.	Building	- Rs.	1,43,000.00
3.	Plant & Machinery	- Rs.	5,02,000.00
4.	Pre-operative expenses	- Rs.	43,000.00
5.	Miscellaneous expences	- Rs.	21,000.00
	Total	- Rs.	7,23,000.00
		= Rs.	7.23 lakhs

Details of fixed capital is given in Annexure - I.

F.2. Working Capital requirement:-

Working capital is the working expenses for a

definite periods (usually 3 months) which depends on the time required to market the product and get the sales value.

The working capital includes raw material, salaries and wages, utilities and other overheads. Other overheads are shown in Annexure - II-3. The working capital requirement calculated on three months basis is Rs.20,29,000.00 shown below.

This working capital requirement depends on the
(a) duration for which raw material inventories has to be kept optimum, so as to ensure uninterupted production
(b) the duration involved in purchasing, manufacturing and selling .
(c) The duration for which finished goods should be stocked to ensure uninterupted supplies.
(d) The duration between selling of goods and the payment to be recovered.

It also depends on credit facilities available from the bank, raw material suppliers and the credit terms between the firm and the customer. So the working capital may be taken as the total variable expenditure involved during the period of 3 months and are classified in the following heads:- Details of working capital are given in Annexure - II.

		Cost Rs.
1. Raw material cost	-	76,76,810.00
2. Manufacturing cost:		
a. Salaries and wages	-	3,42,540.00
b. Cost of utilities	-	50,400.00
3. Other over heads	-	47,540.00
Total working capital (Annual)	-	81,17,290.00
Working capital for 3 months	-	20,29,322.00
Rounded off	-	20,29,300.00

Details of above each item is given in Annexure - II.

F-3. Gross Capital Requirement:-

This is the sum of the fixed capital and working capital requirement and is the total investment on the scheme. Details are given in Annexure - III-1.

F-4. Total Manufacturing Cost:-

It include all direct and indirect costs involved in the manufacturing operation. Annual manufacturing cost can be classified as follows:-

1. Raw material cost
2. Personnel cost ie., salaries and wages.

3. Utilities - it include cost incurred for power, steam and water.

4. Overhead expenses - It include maintenance of building machinery, insurance premium etc.

5. Other fixed costs and interest on loans:- This consists of factory depreciations, interest on term loan and working capital.

The annual costs involved in these heads are as follows:-

1.	Raw material cost	- Rs.	76,76,810.00
2.	Personnel cost	- Rs.	3,42,540.00
3.	Utility	- Rs.	50,400.00
4.	Overhead expenses	- Rs.	47,540.00
5.	Other fixed cost & interest on loans.	- Rs.	4,07,000.00
	Total	- Rs.	85,24,290.00
	Rounded off	- Rs.	85,24,000.00

Details of cost on each of the item above are given in Annexure - IV.

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SECTION - G

FINANCING PLAN

The present system in India is such that the enterpreneur need contribute only a minor percentage of the total investment. The Financial Institution and Nationalised Banks in India will provide the rest of the investment. The assistance given by these institution and Banks differ in nature and the terms and conditions are also different. Some of the financial institution and the nature of assistance given by them are given below:-

G-1-1- State Small Industries Corporation:-

SSI offers machinery on hire purchase on a margin money deposit of 20%. Repayment starts after two years and should be completed within 7 years. It offers special concession to technically qualified persons.

G-1-2- Kerala Employment Promotion Corporation:-

They provides 95% of the cost involved in purchasing, serving, insurance and transportation of all machinery and equipment as loan on an interest of 7.5%.

G-1-3- State Financial Corporation:-

They offers financial assistance as cash to small and medium scale industries. They provides 100% of the machinery cost. Repayment should began in the second half of the second year and is to be completed within 10 years in 17 equal half yearly instalments.

G-1-4- Commercial Banks:-

Nationalised banks offers loans for machinery on 15% marginal money at an interest rate of 12 to 16% in industrially backward areas. Repayment period is 3 years.

G-1-5- Industrial Development Bank of India:-

Offers 85% of the raw material cost at an interest of 12%.

G.2. Financing of the Project:-

Gross capital of Rs.27,52,000.00 is proposed to be raised in the following manner.

Loans	=	23,83,650.00
Own capital	=	3,68,350.00
Gross capital	=	27,52,000.00

G.2.1. Loans:-

85% of the raw material cost is to be borrowed from the Industrial Development Bank at 12% interest. This comes to be Rs.17,24,650.00

Loan for machinery cost is comes to be 6,59,000.00 and it is borrowed from Kerala Financial Corporation at 12% interest.

G-2-2- Own Capital:-

The difference between the Gross capital requirement and the total loans available, is called the marginal money. This is to be borne by the enterpreneur and it comes to be Rs.3,68,350.00.

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SECTION-H

PROFITABILITY

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

1. Rate of return on own capital.
2. Rate of return on capital employed.
3. Percentage profit on sales turnover.
4. Rate of return on fixed capital.
5. Rate of return on working capital.

H-1. Sales turn over and profit account:-

Total quantity produced	=	2,88,000 sq.meter.
Selling price	=	Rs.54/sq.meter.
Total sales turn over	=	Rs.1,55,52,000.00
Less excise duty @ 55% for latex foam	=	Rs. 59,46,000.00
	=	Rs. 96,06,000.00
Less selling & distribution cost @ 5%	=	Rs. 4,26,200.00
		Rs. 91,79,800.00
Less cost of production	=	Rs. 85,24,000.00
Gross profit	=	Rs. 6,55,800.00
Income tax	=	Rs. 4,33,000.00
Net profit	=	Rs. 2,22,800.00

H.2.1. Rate of Return on own capital:-

Own capital	=	Rs. 3,68,350.00
Net profit	=	Rs. 2,22,800.00
Rate of return on own capital	=	60.5%

H.2.2. Rate of return on Fixed Capital:-

Fixed capital	=	Rs. 7,23,000.00
Net profit	=	Rs. 2,22,800.00
Rate of return on fixed capital	=	30.8%

H.2.3. Rate of Return on Working Capital:-

Working Capital	=	Rs. 20,29,000.00
Net profit	=	Rs. 2,22,800.00
Rate of return on working capital	=	11.5%

H.2.4. Rate of return on Total capital:-

Total capital employed	=	Rs. 27,52,000.00
Net profit	=	Rs. 2,22,800.00
Rate of return on Total capital	=	9.5%

H.2.5. Percentage profit on sales turnover:-

Annual receipt from sales	=	Rs. 1,55,52,000.00
Annual profit	=	Rs. 2,22,800.00
Percentage profit on sales turnover.	=	1.5%

BREAK EVEN ANALYSIS

Break even production is one at which there is no profit no loss. A knowledge of break even point is always desirable for an efficient operation of a unit.

$$B.E.P. = \frac{F}{P - V}$$

F = fixed cost / year

P = selling price / sq.meter.

V = variable cost/sq.meter.

Total variable cost:-

1. Raw material cost	- Rs.	76,76,810.00
2. Utilities	- Rs.	50,400.00
3. Interest on working capital	- Rs.	2,06,000.00
4. Sales expense	- Rs.	4,26,200.00
5. Duty	- Rs.	59,46,000.00
Total	- Rs.	1,43,05,410.00

Annual Fixed cost:-

Cost of sales - variable cost.

Cost of sales comprises of cost of production, distribution cost and central excise duty.

Annual fixed cost = Rs. 1,48,96,200.00 -

Total variable cost = Rs. 1,43,05,410.00

= Rs. 5,90,790.00

Annual production = 2,88,000 sq.meter.

Unit selling price = $\frac{1,55,52,000.00}{2,88,000}$ = Rs.54/=

Unit variable cost = $\frac{1,43,05,410.00}{2,88,000}$ = Rs.49.7

∴ B.E.P. = $\frac{5,90,790.00}{54 - 49.7}$

= 1,37,393 sq.meter.

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SECTION- I

ECONOMIC VIABILITY

I-1. Interest commitment:-

Interest on term loan from K.F.C. @ 12%	-	Rs. 79,080.00
Interest on working capital from I.D.B. @ 12%	-	Rs 2,06,000.00
Total	-	Rs.2,85,080.00

I.2. Ability ot Payback Borrowed Funds:-

The term loan has to be paid back within the prescribed time. It is kept at a minimum time, to save the interest.

Loan repayment period:-

1. Annual net profit	=	Rs. 2,22,800.00
Depreciation	=	Rs. 1,22,050.00
		Rs. 3,44,850.00
Less Drawing @ 30%		Rs. 1,03,500.00
		Rs. 2,41,350.00
Amount used for repayment	=	Rs. 2,40,000.00
Term loan to be paid	=	Rs. 6,59,000.00
Pay back period is about		3 years.

SECTION-J

SOCIAL BENEFITS

Establishment of new industry can give personal benefits to the entreprenure and social benefits to the society as a whole.

1. It offers employment.
2. Utilisation of capital and skill.
3. As is to be developed in an underdeveloped area, offers distribution of industry all over the country.
4. Increase of revenue earnings through taxes and Excise duty.

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SECTION-K

CONCLUSION

1.	Total fixed investment	-	Rs. 7.23 lakhs.
2.	Working capital requirement	-	Rs. 20 lakhs.
3.	Total investment	-	Rs. 27.23 lakhs.
4.	Working shift/day	-	1
5.	Employment potential	-	49
6.	Annual production	-	2,88,000 sq.meter.
7.	Annual sales turnover	-	1.6 crores.
8.	Break even production	-	1,37,393 sq.meter.
9.	Rate of return on investment	-	9.5%
10.	Term loan repayment period	-	3 years.

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A N N E X U R E S

ANNEXURE-I

Fixed Assets:-

	Item		Cost Rs.
1.	Land and building	-	1,57,000.00
2.	Plant & Machinery	-	5,02,000.00
3.	Pre-operative expenses	-	43,000.00
4.	Miscellaneous	-	21,000.00
	Total fixed assets	-	7,23,000.00

ANNEXURE - I-1

Land & Building:-

	Item		Cost Rs.
1.	Cost of 5000 sq.ft. of land @ Rs.3/sq.ft.	-	15,000.00
2.	Cost of 4800 sq.ft. of built up area	-	1,41,000.00
3.	Site improvement and fencing	-	1,000.00
	Total	-	1,57,000.00

ANNEXURE-I-2

PLANT & MACHINERY:

	Item	No.	Price per item Rs.	value in Rs.
1.	Deammoniation tank fitted with stirrer, 200 litre capacity, 2 HP motor	2	4000.00	8,000.00
2.	Mixer Planetary capacity 100 litre with 5 HP motor	2	40,000.00	80,000.00
3.	Ball mill and emulsifier 2 HP motor	2	10,000.00	20,000.00
4.	Compounding tank fitted with stirrer 1HP motor	2	6,000.00	12,000.00
5.	Spreading equipment 1 HP Motor	1	25,000.00	25,000.00
6.	Boiler, capacity 100 kg/hr, with 3 HP motor	1	60,000.00	60,000.00
7.	Drier, with steam pipes	1	75,000.00	75,000.00
8.	Conveyor system with steel conveyor 4 HP Motor		25,000.00	25,000.00
9.	Let off & wind up system 4 HP Motor		20,000.00	20,000.00
10.	Water pump & piping 8 HP motor		15,000.00	15,000.00
11.	Platform balance 200 kg. capacity.	1	3,000.00	3,000.00
12.	Lab.equipments 2 HP Motor		25,000.00	25,000.00
13.	Miscellaneous equipments		3,000.00	3,000.00
	Total			3,71,000.00

contd.....

Total	- Rs.	3,71,000.00
Contigency for price escalation @ 10%	- Rs.	37,100.00
	Rs.	4,08,100.00
Erection & installation @ 10%	- Rs.	40,810.00
Sales tax @ 8.8%	- Rs.	32,648.00
Distribution system for water, steam, lighting and cabling @ 5%	-Rs.	20,405.00
Total	- Rs.	5,01,963.00
Rounded off	- Rs.	5,02,000.00

ANNEXURE-I-3

Miscellaneous fixed assets:-

	Item		Cost Rs.
1.	Office equipments & furniture	-	12,000.00
2.	Fire fighting equipment	-	2,000.00
3.	Equipment for supplying water and steam	-	2,000.00
6.	Miscellaneous equipments	-	5,000.00
	Total	-	21,000.00

ANNEXURE - I-4

Pre-operative expenses:-

	Item		Cost Rs.
1.	Interest on loan @ 12% for 3 months	-	19,770.00
2.	Establishment	-	2,000.00
3.	Property tax	-	250.00
4.	Travelling expense	-	1,000.00
5.	Postage, telephone, telegram and legal charges	-	1,000.00
6.	Advertisement & printing	-	2,000.00
7.	Building Insurance	-	3,000.00
8.	Provision for meeting the unexpected rise in building cost	-	14,000.00
	Total	-	43,020.00
	Rounded off	-	Rs.43,000.00

ANNEXURE - II

Working Capital

Item		Cost Rs.
1. Total Raw Material Cost	-	76,76,810.00
2. Direct manufacturing cost	-	3,92,940.00
3. Other overheads	-	47,540.00
Total	-	81,17,290.00
Working Capital for 3 months	-	20,29,322.00
Rounded off	-	20,29,000.00

ANNEXURE-II-1

Raw Materials:-

Material	Requirement per annum Kg.	Price/ Kg. Rs.	Cost per annum Rs.
60% N.R. Latex (D.R.C)	143040	17.50	25,03,200.00
Potassium Oleate	2139	45.00	96,255.00
Sulphur	3570	3.50	12,495.00
ZDC	1425	42.00	59,850.00
ZMBT	1068	50.00	53,400.00
A/O SP	1425	40.00	57,000.00
Clay	21420	0.60	12,852.00
ZnO	4290	18.00	77,220.00
DPG	285	42.00	11,970.00
Sodium silico fluoride	1428	6.00	8,568.00
Miscellaneous*			6,000.00
Packing materials			1,70,000.00
Total			30,68,810.00
Coir carpet required per annum =2,88,000 sq.meter			
Value of carpet per annum @ Rs.16/M^2			46,08,000.00
Total value of raw materials/annum		Rs.	76,76,810.00
Total value of raw materials for 3 months			19,19,202.00
Rounded off			19,19,000.00

* Belloid T.D., Ammonia, Oleic acid etc.

ANNEXURE-II-2-2

Salaries & Wages:-

Position	Total personnel per day	Monthly salary Rs.	Total salary Rs.
a) Administrative Staff:-			
Managing Director	1	2000.00	2,000.00
Export Manager	1	1500.00	1,500.00
Marketing Assistant	1	600.00	600.00
Sales Representative	2	1000.00	2,000.00
Sales cum Purchasing Officer	1	850.00	850.00
Clerk cum Typist	2	300.00	600.00
Peon	1	200.00	200.00
	9		7,750.00
b) Technical Personnel:-			
Technical Manager	1	1200.00	1,200.00
Technical Assistant	1	850.00	850.00
Production Supervisor	2	700.00	1,400.00
	4		3,450.00
c) Labour:-			
Skilled labour	12	500.00	6,000.00
Semi skilled labour	7	400.00	2,800.00
Unskilled labour	17	350.00	5,950.00
	36		14,750.00
	Grand Total		25,950.00

Total Salaries & wages/month = 25,950.00
Total salaries & wages/annum = 3,11,400.00
Benefit & allowances @ 10% = 31,140.00
Total salaries & wages including benefits = 3,42,540.00 Rs.

ANNEXURE - II-2

Direct Manufacturing Cost (Annual)

Item		Cost Rs.
1. Cost of utilities	-	50,400.00
2. Salaries & Wages	-	3,42,540.00
Total	-	3,92,940.00
Rounded off	-	3,93,000.00

ANNEXURE -II-2-1

Cost of Utilities:-

Item		Cost Rs.
1. Cost of water/annum	-	2,700.00
2. Cost for steam/annum	-	32,400.00
3. Cost for power/annum	-	15,300.00
Total	-	50,400.00

ANNEXURE-II-3

Other overheads:-

	Item		Cost Rs.
1.	Repair & maintenance of building @ 1%	-	1,200.00
2.	Repair & maintenance of machinery @ 5%	-	25,100.00
3.	Travelling & Advertisement expenses		3,000.00
4.	Insurance @ 2% on fixed capital	-	14,240.00
5.	Property taxes	-	1,000.00
6.	Stationary, Postage and telephone	-	2,000.00
7.	Miscellaneous	-	1,000.00
	Total	-	47,540.00
	Rounded of	-	47,500.00

ANNEXURE - III-1

Gross Capital Requirement:-

Total fixed capital	- Rs.	7,23,000.00
Total working capital for 3 months	- Rs.	20,29,000.00
Total	- Rs.	27,52,000.00

ANNEXURE - III - 2

Loans:-

Item	-	Rs.
Long term loan from K.F.C. @ 12%	-	6,59,000.00
Loan from I.D.B.	-	17,24,650.00
Total	-	23,83,650.00

ANNEXURE-IV

Total cost of production:-

	Item		Cost Rs.
1.	Raw material		76,76,810.00
2.	Personnel cost	-	3,42,540.00
3.	Utilities	-	50,400.00
4.	Other overhead expenses	-	47,540.00
5.	Other fixed costs and Interest on loans	-	4,07,000.00
	Total		85,24,290.00
	Rounded off		85,24,000.00

ANNEXURE-IV-1

Other fixed cost & Interest on loan:

	Item		Rs.
1.	Depreciation:		
	a. Depreciation on machinery @ 10%	-	50,200.00
	b. Depreciation on building @ 5%	-	7,850.00
	c. Amortisation of pre-operative expenses @ 10%	-	64,000.00
2.	Interest on loan:		
	1. Interest on term loan @ 12%	-	79,080.00
	2. Interest on working capital @ 12%	-	2,06,000.00
	Total	-	4,07,130.00
	Rounded off	-	4,07,000.00

APPENDICES

APPENDIX - I

Region wise share of coir products export from India.

V = Value in %
Q = Quantity in %

Country	1974 - 75		1975-76		1976-77		1977-78		1978-79	
	Q	V	Q	V	Q	V	Q	V	Q	V
W. Europe	62	62	56	57	62	63	64	63	68	67
E. Europe	11	11	17	16	8	7	8	7	7	6
America	16	16	14	15	13	14	18	19	17	18
W. Asia	4	4	4	3	6	5	4	4	3	4
E. Asia	6	6	8	8	10	10	5	6	4	5
Africa	1	1	1	1	1	1	1	1	1	-
Total	100	100	100	100	100	100	100	100	100	100

Sources:- Coir Board Bulletin - 1979-80.

APPENDIX-II

Country wise export of Rugs and Carpets from India during 78-79 and 1979-80.

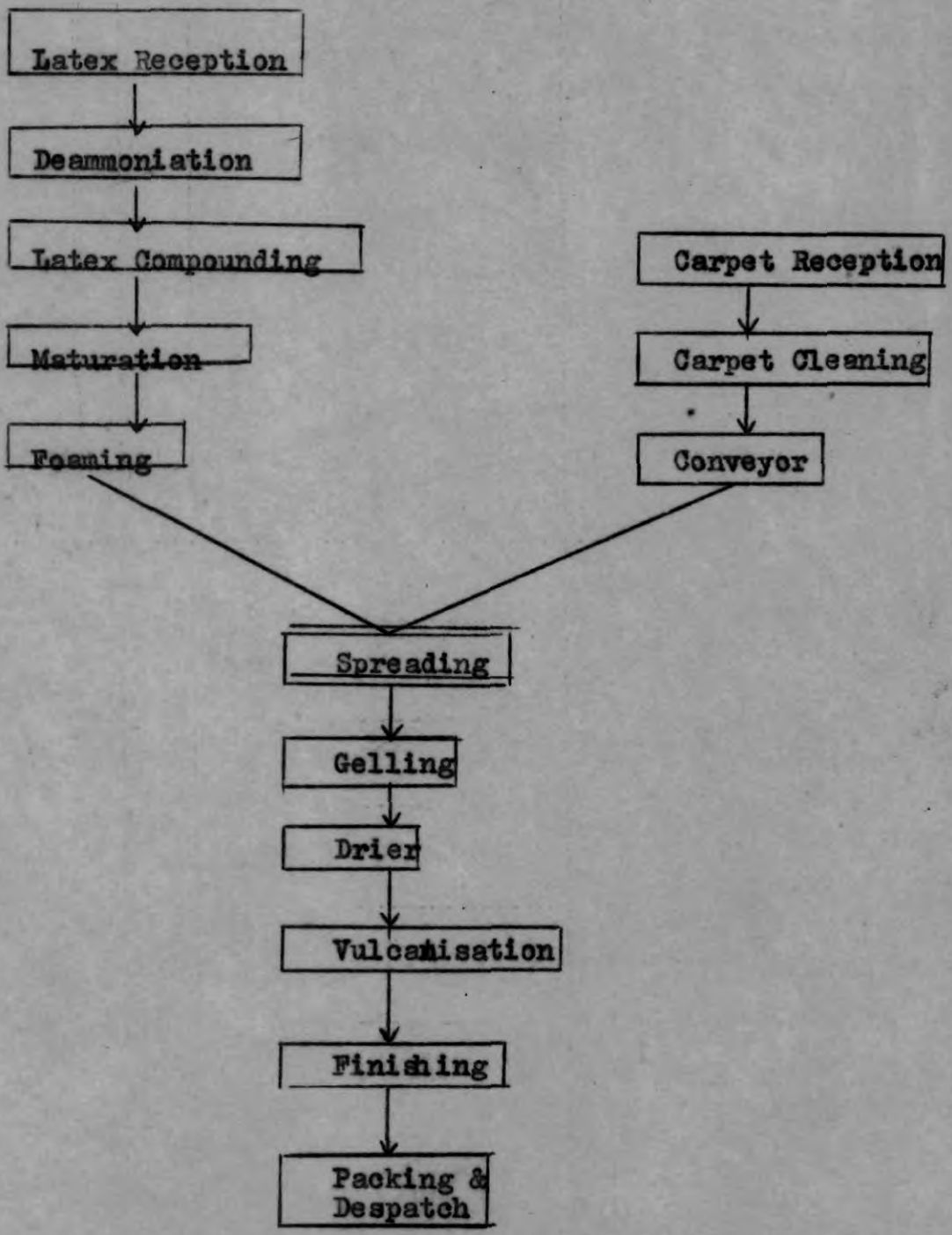
Q = Quintals
V = Value in Rupees.

Country	April-March 78-79		April-March 79-80	
	Q	V	Q	V
Belgium	260	334132	213	342417
Curacco	32	42376	--	-
Canada	86	86435	--	--
Denmark	592	750971	1268	2193064
France	272	224263	517	547360
Germany	1071	867651	1170	1320898
Greece	15	9635	--	--
Italy	343	365513	288	324848
Netherland	--	--	29	47431
Surinam	4	4537	24	25039
Switzerland	76	93110	59	83924
Sweeden	4	848	22	37034
USA	1544	1509484	1683	2152165
UK	44	45423	175	244179
USSR	7641	5698026	7744	5914638
Finland	--	--	6	6822
Total	11984	10032409	13198	13219819

Source:- Statistical Bulletin of Coir Board - 1979-80.

APPENDIX-III

FLOW CHART

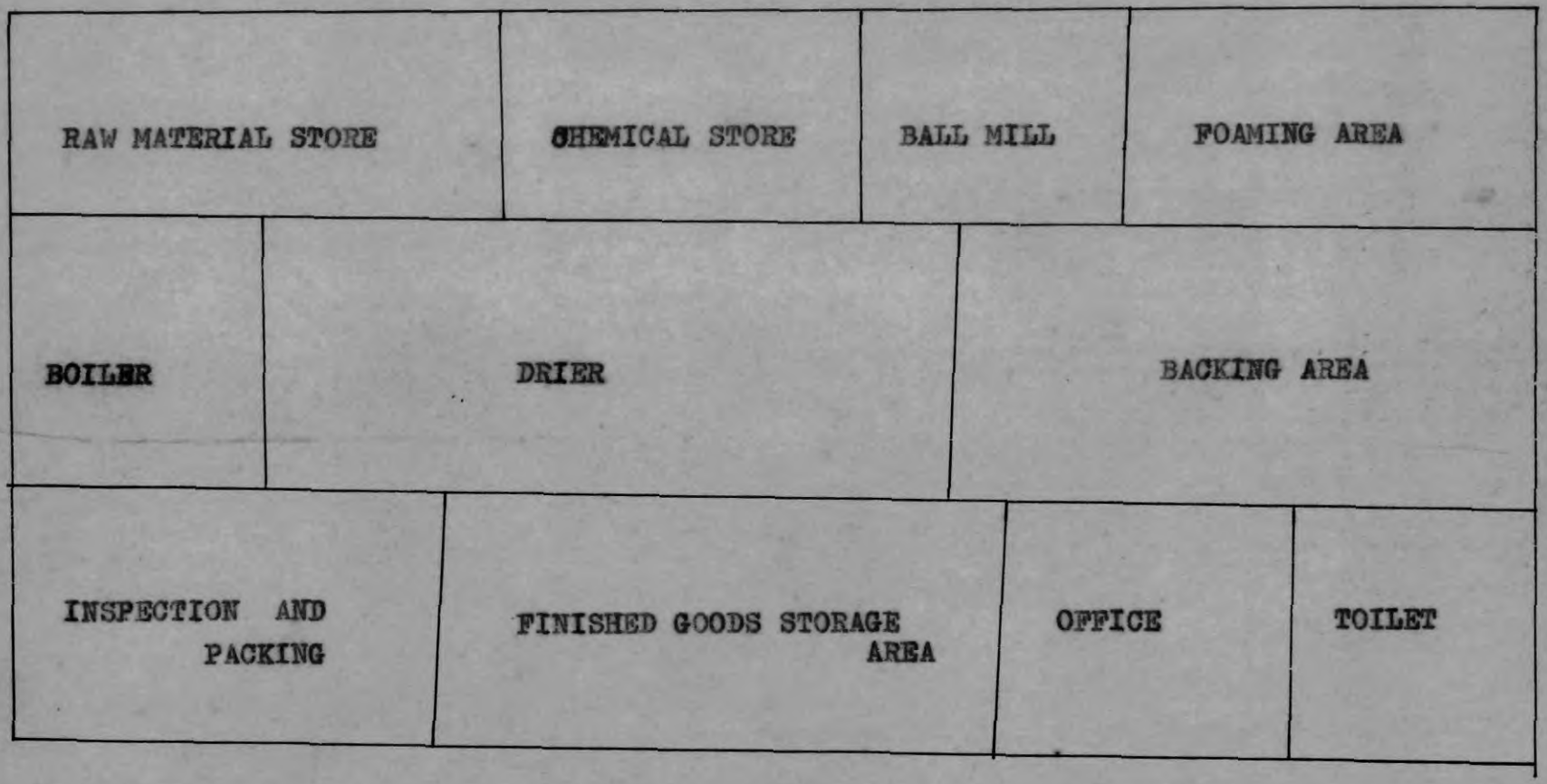


APPENDIX-IV

PLANT LAY OUT

Land : 5000 sq.ft.

Building : 4800 sq.ft.



APPENDIX - V

Typical formulation

	Item	Dry	Wet
60%	N R latex	100	167
20%	Potassium oleate	1.5	7.5
50%	Sulphur	2.5	5.0
50%	ZDC	1.0	2.0
50%	ZMBT	0.75	1.5
50%	Accinox SP	1.0	2.0
Soft clay		20.0	30.0
50%	ZnO	3.0	6.0
20%	DPG	0.2	1.0
20%	Sodium Silicofluoride	1.0	5.0
		130.95	227.0

APPENDIX-VI -1

List of Raw Material Suppliers

1. 60% Centrifuged Latex:-

   a) Padinjarekara Agencies,
   Kottayam.

   b) Plantation Corporation of Kerala,
   Kottayam.

2. Rubber Cemicals:-

   a) M/S Bayer India Ltd.,
   82, Vir Nariman Road,
   P.B. No. 1436,
   Bombay-400001.

   b) The ACCI Ltd.,
   34, Chowringhee Road,
   Calcutta -13.

   c) Mindia Chemicals Ltd.,
   Wake Field House,
   11, Sprost Road,
   Ballard Estate,
   Bombay - 400038.

3. Zinc Oxide - White Seal.

   a) Anand Chemicals,
   8, Horniman Circle,
   Bombay - 400001.

4. Belloid TD

   a) Suhrid Geigy Ltd.,
   Baroda, Gujarat.

5. Oleic acid:-

   a) Godrej soap Ltd.,
   249, Mowbray Road,
   Alwarpet,
   Madras-18.

   b) Gopal Kamath,
   Kaloor Road,
   Cochin - 18.

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APPENDIX-VI-2

Manufacturers of Coir Mats, Mattings and Carpets

1. Charankattu Coir Manufacturing Co (P) Ltd.,
   Shertallay P.O.,
   Kerala.

2. The Travancore Mats & Matting Co.,
   Shertally P.O.,
   Kerala.

3. The Kerala Coir mats & matting Co-operative Society, Ltd. No. 346,
   Alleppey P.B. No.2,
   Kerala,

4. The Prasad Exporters P.B.No.243,
   Alleppey, Kerala.

5. Union Rug Mills,
   P.B. No. 115,
   Alleppey, Kerala.

Exporters of Coir Carpets:-

1. The general Supplies Agency,
   P.B. No. 27, Alleppey.

2. Nava Bharat Enterprises Pvt.Ltd.,
   P.B.No. 54,
   W/Island,
   Cochin-3.

3. The shertallai Coir Mats & Matting Co-operative Society Ltd. No. 240,
   Shertallai, Kerala.

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APPENDIX-VII

List of Machinery Suppliers

Planetary mixer:-

Gransons Ltd.,
207, Kakad Chembers,
Dr.Annie Basant Road,
Bombay-18.

Boiler:-

1. Kosha (India) Ltd.,
   N.K. Industrial Estate,
   Vishewshar Road,
   Off. Avery Road,
   Goregaon,
   Bombay-400063.

2. Varsha Boilers Pvt.Ltd.,
   Green House,
   Bombay-1.

3. Wanson India (P) Ltd.,
   Brown Boveri House,
   Annei Beasant Road,
   Bombay-25.

Rubber Testing Equipment:-

Blue Steel Engineers (P) Ltd.,
144, A/2 Industrial Estate,
Ferguson Road, Bombay-13.

Weigh balance:

Avery (India) Ltd.,
Armenian Street,
Madras - 1.

Drier:-

Kelachandra Metal Works,
Chingavanam,
Kottayam, Kerala.

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References:-

1. Proceedings of International Rubber Conference, Kulalumpur - 1975 Vol. 5.

2. "COIR" - Vol XXI No.3 1977.

3. Rubber India, Vol. XXX, No.2, 1978.
" Vol. VII, No.2, 1976

4. NR Technology - No.8, 1970.

5. Rubber Age - 1949, September.

6. Coir Board Journal, 1979-80.

7. Rubber Developments, Vol.23, 1970
" Vol.21. 1968
" Vol.24. 1971
" Vol.28 1975
" Vol.15 1962
" Vol.14 1961

8. "Pliolite latex" - Foam backing of carpets.
Good year Tyre & Rubber Company Publications.

9. Indian Rubber Statistics - 1979.

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