UNIVERSITY OF COCHIN

B. TECH. COURSE

IN

POLYMER SCIENCE & RUBBER TECHNOLOGY

PROJECT REPORT

ON

A SMALL SCALE UNIT

TO MANUFACTURE

CHEMICALS SUCTION & DISCHARGE HOSES

IN KERALA

DISSERTATION

SUBMITTED BY

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A C K N O W L E D G E M E N T

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C O N T E N T S

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A. INTRODUCTION

A. INTRODUCTION.

This is an attempt to trace the feasibility of small scale production of Chemicals Suction and Discharge Hoses in Kerala. Though it may not be exhaustive in this respect, I hope, this would be of some help to novice in this field.

A.1. (i) History:-

Rubber tubes had been in use, long since past, as a flexible device for handling fluids. Later on, the severity of service conditions (as for high pressure or vacuum needs), necessitated the incorporation of reinforcing plies of fabric over the tube, and gave rise to the different types of 'hoses' used at present. (Helical spirals of metallic wire, provide additional reinforcement for Suction hoses (or 'Armoured hoses') used under vacuum)

(ii) Main object of the project:-

The dynamic growth of the chemical industry of our country, especially those of fertiliser units, had made it imperative, that their needs of chemical transfer hoses, be met promptly. Rubber hoses with proper reinforcement, can meet the above requirement to a high level of satisfaction. The main object of this project is to cater a good share of the needs of chemical & fertiliser plants, in and around the state.

(contd.....2.)

The proposed project aims at the manufacture of 37800 metres of chemical transfer hose per year, in a range of different sizes(as shown in appendix VI).

A.2. PRODUCT DESCRIPTION:

Rubber hoses may be divided into two broad categories - Suction and Discharge (Delivery) hoses. Suction hoses are used to transfer fluids such as petroleum, water, oils, chemicals etc. under vacuum conditions, on the suction side of pumps. Delivery hoses are employed for handling water, air, gases, steam, beer, milk and a variety of chemicals, all under pressure.

The basic component parts of a plain delivery hose are:-

1) An inside rubber liner tube, compounded to withstand the corrosive effect of the fluid coming in contact with it, under service conditions.

2) The reinforcing elements consisting of either multiple plies of rubberised woven fabric (cut on the bias), or one or more layers of braided cords. These are applied for strengthening purpose, to withstand the pressure applied to the liquid being conveyed.

3) A rubber cover over the plies, compounded to resist the working conditions.

The Suction hoses (Armoured hoses) have an additional spiral wire reinforcement between the plies, to prevent the collapse of the hose during suction. They may be built with flanged ends, for fitting to the pipe line.

(contd .. 3)

This Project envisages the manfuacture of armoured hoses and plain hoses in a range of different sizes. (sizes in between can also be made according to the requirements).

Constructional features and dimensions of a type produced in greater length, are given below:-

I.D. of the bore = 50 mm, smooth bore type, 4 ply fabric and single wire reinforcement;

Length of one piece = 6 M.

Both ends flanged with 4 bolt-holes, (Rubber flanges built'in-situ'.)

Constructions:- 1-(Armoured hose)

The following elements go into construction from inside - out:-

(a) Rubber liner tube, I.D. = 50 mm.

(b) Rubberised fabric, 2 plies.

(c) G.I. Wire, 1.5 mm dia, Spiralled at a pitch of 18 mm.

(d) Filler rubber sheet, thickness = 1.5 mm.

(e) Rubberised fabric, 2 plies.

(f) Cover rubber sheet, thickness = 1.5 mm.

and (g) Flanges at the ends (built from rubber discs and rubberised fabric); 4 bolt holes.

(2) Plain rubber hose is different from the above, in that, it has no wire reinforcement between plies. Instead, it has the desired number of rubberised fabric plies between the liner and the cover.

(contd ..... 4)

A.3. Evaluation of prospects:-

In an environment of flourishing chemical industry, rubber based suction and discharge hoses have got a very bright future. NR is available in our country in plenty and at an economical price, and is a good non-corrosive material for a wide range of chemicals. This accounts for the preferance of NR to the petrochemical base raw polymers being used for competing products. The recent hike in petroleum prices also favour this change-over to natural rubber. The prospects of rubber hoses, in the coming future areindicated by the following estimates.

Rubber consumption for hoses:

Period	Production figs*	Consumption*
1989 - 90	29 million metres	4000 tonnes
2000 A.D.	72 " "	11000 "

* Estimated figures | Source:- Rubber directory of India, 2nd edn., 1978-'79.

Properly designed hoses with butyl rubber, neoprene or hypalon as base polymer can also be made to meet the stringent working conditions of the chemical industry.

The new project of R.C.F.(Rashtriya Chemicals & Fertilizers) to come up at Thal by 1983-'84, and the fertilizer plant at Haldia (W.Bengal) to be commissioned soon, adds to the scope of Chemicals S & D hoses.

(contd..... 5.)

B. MARKET SURVEY

B. MARKET SURVEY:

1 (i) User's and Customer's analysis:-

As mentioned at the onset of the project, the chemical and fertilizer units constitute the major segment of the market for the product. Armoured hoses of I.D. 50mm and larger were found to be of greater demand than the rest.

Internal market:-

The main consumers of chemicals suction and discharge hoses, inside the state include:-

1. Fertilizers And Chemicals Travancore Ltd., Udyogamandal, Alwaye.
2. Fertilizers And Chemicals Travancore Ltd., Ambalamedu, Cochin.
3. Travancore Cochin Chemicals Ltd., Alwaye.
4. Travancore Titanium Products Ltd., Trivandrum.

and 5. Kerala Minerals and Metals Ltd., Chavara, Quilon.

An idea of the relative demand by these firms can be had from the following figures:

No.	Consumer	Length in metres
1.	F.A.C.T. Ltd., Udyogamandal, Alwaye.	4000
2.	" " Ambalamedu, Cochin.	1000
3.	T.T.P. Ltd., Trivandrum	2500
4.	T.C.C. Ltd., Alwaye.	2000
5.	K.M.M.L. Ltd., Quilon.	3000

F.A.C.T. Ltd. requires armoured hoses, mainly with I.D. 75 mm and 50 mm. 100 mm I.D. hoses also have

(contd..... 6)

good demand. T.T.P. Ltd. needs 75 mm I.D. hoses in bulk, followed by 63 mm and 50 mm. T.C.C. Ltd., consumers plain delivery hoses having I.D. ½" to 1½", in large numbers. Besides 75 mm. hoses are also required to a good extent. The Titanium Dioxide plant of K.M.M.L. (Chavara) was found to have a very good demand of armoured rubber hoses (I.D. 150 mm and 100 mm), recently. This very high demand in its infant stage, is a good indication of the good market potential for Chemicals Suction and Discharge hoses.

External market:-

Another major consumer of Chemicals Suction and Discharge hoses (especially, phosphoric acid hoses) is R.C.F. (Rashtriya Chemical & Fertilizers, a branch of F.C.I.), to whom Cosmos India Rubber Works, Bombay are supplying in bulk. F.C.I. Sindri Division also requires Chemicals Suction and discharge hoses in large numbers.

B.1 (ii) Present demand:-

Analysis of the annual production figures of different types of hoses, by major manufacturers gives the following data:-

(a) Armoured hoses:- The sizes having greater demand at present, are - (i) 50 mm I.D., 6m. length pieces (ii) 75 mm. I.D., 6 m length pieces and (iii) 100 mm I.D. and 150 mm I.D. as 3 m. length pieces.

(b) Plain delivery hoses:- Plain delivery hoses of greater demand are found to be having 25 mm. I.D. and 19 mm. I.D.

(contd.... 7)

For both armoured hoses and plain delivery hoses, the sizes in between these, were found to have lesser demand in varying proportions,

A production schedule is to be made taking into consideration, the extent of demand of each type.

B.1(iii) Sources of supply:-

At present, there are 60 major, Rubber hose manufacturers, scattered throughout the country. The main producers include Cosmos India Rubber Works Pvt. Ltd., Bombay & Vijayawada; Dunlop India Ltd., Calcutta; Mansfield Rubber Co. Pvt. Ltd. Gaziabad; Simplex Rubber Products Pvt. Ltd.Ahmedabad; Swastik Rubber Products Ltd., Poona etc.

GEOGRAPHICAL DISTRIBUTION OF SUPPLIERS:

Sl.No.	Place	No. of major firms
1.	AHMEDABAD	2
2.	ANDHRA PRADESH	2
3.	BOMBAY	11
4.	CALCUTTA	15
5.	DELHI	5
6.	FARIDABAD	4
7.	GAZIABAD	2
8.	GUJARAT	3
9.	HARYANA	1
10.	HOWRAH	1
11	JAMSHEDPUR	1
12	KANPUR	1
13	KERALA	4
14	MANGALORE	1
15	POONA	5
16	TAMIL NADU	2
	Total	60

Source:- Rubber Directory of India - 2nd Ed., 1978 - '79.

(contd.. 8)

The above table shows that the major hose manufacturers are centralized around Calcutta and Bombay. Kerala has got four major hose manufacturers, viz.

Ceakay Rubber Industries, Changanacherry;

Joey Rubber Works, Calicut;

South Indian Rubber Works, Alleppey &

Trivandrum Rubber Works, Ltd., Trivandrum.

B.2. FUTURE DEMAND:-

It is observed that the existing level of Chemicals & S.&D Hoses production is inadequate to meet the rapidly growing demand of market and gives hopes to an entrepreneure coming to this field.

B.3. PRICES AND EFFECT OF PRICE CHANGE ON DEMAND:

The basic prices of the range of sizes in the product-line would be as per the values given in appendix VI. These prices are subjected to slight variations according to variations in quality, demanded by the customers.

Unlike many other products, heavy-duty Chemicals S & D hoses have a lower 'elasticity of demand'. Thus, reduction in price level with consistant good quality is essential for better demand.

B.4 (i) Competitive situation & Export possibilities:

Competitive products: -

Literature on two of the products substituting the proposed hose, in the international market are given below:-

(1) "Transfer hose" 'A new fluoro carbon lined, acid-suction and discharge transfer hose is designed for use in transferring acids, caustic substance, solvents

(contd.. 9)

or fluids at elevated temperatures. Developed by Penntube Plastics Co., Clifton Heights, Pa. 19018, the hose's chemically inert liner maintains the purity of the substances being transferred and prevents the body of the hose from deteriorating due to the chemically active fluids passing through. It is available in 8 sizes with inner dias from ½" to 3". Normally, supplied with straight cut ends, the hose is available with standard male fittings, quick disconnect fittings, flange fittings or moulded flange ends'.

Source:- (Rubber India; Vol XXX No.12 - Dec. '78).

2. All purpose hose:-

'An all-purpose hose, designed for oil, chemical and acid suction and discharge applications, is marketed exclusively in the U.S. by Acme-Hamilton Mfg. Corpn., East State St., Box 361, Trenton, N.J. 08603. Called 'Blue Heliflex', the hose weighs half as much as conventional rubber hose, costs one-third as much and offers more durability for handling a wide range of chemicals and petroleum products, Its specially blended PVC construction, reinforced by a spiral made of rigid PVC, fused into the wall of the hose, withstands high vacuum and discharge pressures. The hose resists kinking and crushing, and is applicable in the most severe environmental conditions, including corrosive atmospheres and temperatures ranging from - 13 to 150° F. Hose sizes ranges from 1" to 8" I.D. and 1 3/8 to 8 15/16" O.D., and can be ordered in any

(contd.. 10)

required length. They can be supplied with flanged or enlarged ends and used with most commercially available couplings and flanges' (Rubber Age)

Source:- (Rubber India, Feb. 1975).

Both the above products, especially, the second one mentioned competes fairly well with NR suction and discharge hoses. The base polymer, Natural rubber, being, indegeneously available in Kerala at a lower rate the product can be sold out in the foreign markets at a negotiable rate. But, it is essential that the quality should be maintained at a consistent, fairly high level.

B.4 (ii) Export possibilities:-

An idea of the export potential of Rubber hoses, can be had from the following statistical figures:-

EXPORT OF RUBBER HOSES:

No.	Year	(Values in 000'Rs)	% of total export of Rubber goods.
1.	1970 - '71	1883	--
2.	1971 - '72	1744	--
3.	1972 - '73	773	--
4.	1973 - '74	1438	--
5.	1974 - '75	2117	--
6.	1975 - '76	2735	1.81
7.	1976 - '77	3544	1.30
8.	1977 - '78	4904	1.79
9.	1978 - '79	6000	1.85

Source - (Rubber directory of India, 2nd edn. 1978'79)

From 1972-'73 onwards, the export market for hoses had been steadily increasing. More than proportionate increase is observed for the last four years.

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C. PRODUCTION REQUIREMENTS

C. PRODUCTION REQUIREMENTS:

1. LOCATION:-

The factory is expected to function at an Industrial Estate of Ernakulam dist. The site selected has got the following benefits:-

a) Nearness to the customers:-

Most of the major consumers of the product such as FACT Ltd., Udyogamandal, Alwaye; FACT Ltd. (Cochin Divn.) Ambalamedu, T.C.C.Ltd. Alwaye etc. are located in the vicinity of the site. This helps in reducing the extent transport of finished goods, thereby facilitating quick and prompt delivery.

b) Availability of raw materisls:

The raw materials required are indigenously available from local suppliers, either at Ernakulam or Kottayam. (Detailed list given in appendix V).

c) Labour:-

The unit, being at an industrialising area, can procure the right type of labour, as is required. (The requirements are shown in annexure III c).

d) Transportation of raw-materials and finished products:

Transportation by road, water and rails would be very convenient for this site. Since the unit would function at an Industrial Estate, the necessary infrastructural needs, such as water, power etc. can be obtained at a lower rate without much difficulty.

(contd..... 12)

C. 2. REQUIREMENTS OF MAIN RAW MATERIALS:

The base polymer - NR can be obtained from any of the licensed rubber dealers in the local market.

The mineral fillers required in bulk, such as Barytes, China Clay and Whiting can be procured from local suppliers at Ernakulam or Kottayam.

Other chemicals such as sulphur, accelerators, antioxidant, activators, tackifier, carbon black etc. are also readily available from local suppliers.

Consumable items such as cotton fabric ('Industrial sheeting'), G.I.wire, M.S.plates etc. are also locally available.

(Detailed list of annual raw material requirement, with their prices are given in annexure III a).

(List of raw-material suppliers and local agents are given in appendix V).

C.3. LAND AND BUILDING:

The land and buildings would be acquired on rental basis. A provision of Rs. 1000/- per month is set apart for this.

Building:- The plinth-area of the building required for the factory would be 5600 ft.^{2} The distribution for the different sections would be as follows:-

(contd .. 13)

Symbol	Section	Dimensions (breadth x length)	Area(ft^2)
A	Office & Administration	10' x 47'	470
B	Packing Sectionn& product store.	5' x 65'	325
C	Quality Control	5' x 65'	325
D	Vulcanization	6' x 112'	672
E	Hose building	15' x 58'	870
F	Mandrels Storage	9' x 58'	522
G	Extruder + accessories.	17' x 14'	238
H	Mixing mill + accessories.	17' x 19'	323
I	Calender + accessories.	17' x 21'	357
J	Fabric preparation	7' x 54'	378
K	Raw material Store & Tool room.	10' x 40'	400
L	Compounding.	10' x 14'	140
M	Maturing.	10' x 11'	110
N	Compressor, Boiler & Pump.	10' x 32'	320
O	Toilet.	10' x 15'	150
	Total	50' x 112'	5600

(An additional land of 1800 ft^2 is also foreseen for the possible expansion in the future)

(The layout of the plant is shown in appendix III).

(contd.....14)

C.4. MACHINERY REQUIREMENTS:

The project aims at the manufacture of 37800 M. length of hoses per year. This needs the following pieces of machinery with the capacity given, to operate in 2 shifts of 8 hrs. each, per day:-

a) Mixing mill:

One mixing mill of size 14" x 36" complete with the drive and accessories, worth Rs.1,20,000/- basic-price. This can mix 30 kg. of compound per batch. 4 hours of mixing per shift would provide the required amount of rubber compound for one shift; (290 kg.) This is available from Sohal Engg. Works, Bhandup, Bombay or Kelachandra Iron & Steel Works, Chingavanam, Kottayam.

b) Extruder:

An extruder of size 4½" complete with drive and accessories (such as tubing and hose head) is also required. (Extrusion speed - 70 m/hr). This could extrude 53 m. length of liner tube, for one shift, within one hour. The required machine can be obtained from Richardson & Cruddas Ltd., Mulund, Bombay.

c) Calender.

A 3-roll, vertical calender of size 8" x 24" with drive and accessories, is required for rubberising the fabric and sheeting-out filler and cover plies. This should work 2 hours to meet the requirements per shift (Steam-heated drier-rolls also should be procured, for drying the fabric before coating). Sohal Engg. Works, Bhandup, Bombay would provide the requirements.

(contd.. 15)

e) Boiler:

A boiler, capable of generating 500 kg. of Steam per hour at 7.5 kg/cm^2, suitable for wood firing, is to be installed. This may be obtained through the local agents of 'Batliboi & Co. Pvt. Ltd., Bombay.

f) Air-compressor:

An air-compressor (capacity 100 C.F.M.) and working pressure 100 psi. also should be purchased. This can be had from 'Kirloskar Pneumatic & Co., Pune via the local agents at Ernakulam.

g) Testing equipments:

Instruments for Quality Control, such as hydraulic pressure tester, ply-adhesion tester, Hardness (Shore-A) tester etc. would be available from Premier Scientific Sales Pvt. Ltd., New Delhi-8, Rehash General Agencies, Bombay; Concord Instruments Pvt. Ltd., Cochin etc. the address of whom are given in appendix IV.

h) Other items, such as mandrels, weighting-balance bench grinder etc. can be purchased from local suppliers.

The details of machinery requirement and prices are given in Annexure - I.

The list of machinery suppliers are included as appendix IV.

It is expected that the machinery and equipment would be available within a reasonable delivery period of three months.

(contd....16)

C.4. MAN-POWER REQUIREMENTS:-

The total employment potential is estimated at 61 persons. The requirement of various categories of personnel and their remunerations are given in Annexure III c.

30% of the basic-pay would be provided for benefits such as E.S.I., P.F., etc.

C.5. INFRA-STRUCTURAL NEEDS:

The requirements of electric power, water, fuel etc. are as shown in annexure III b.

(A transformer of 200 kVA should be installed for the necessary power requirement).

Transport facilities by road, rail or water would be also available.

Communication facilities such as Post & Telegraph, Telephone etc. are also foreseen for the site selected.

Thus, it is anticipated that these essential services shall be available according to the needs.

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D. MANUFACTURING PROCESS

D. DESCRIPTION OF PROCESS OF MANUFACTURE:-

(Armoured hose; Smooth bore construction)

1. Process details:-

The manufacturing sequence involve the following stages:-

(a) Production of basic components - liner tube, rubberised fabric, filler and cover plies.

(b) Preparation of rubberised fabric.

(c) Hose building.

(d) Curing in horizontal auto claves.

(e) Ejection from mandrel, inspection and testing.

and (f) Packing, marking and despatch.

(a) Production of basic components:-

The required ingredients are weighed, as per the formulations given in appendix I. The rubber compound is mixed on the Mixing-mill, sheeted-off, cooled in water tank and allowed to mature for 24 hrs.

The matured, liner compound is warmed up and strip-cut on the mill. Hose liner tube of required I.D. and wall thickness is extruded, cooled in water, dusted with talc and coiled on the winding table.

The fabric-coating compound is warmed up and rolled out on the mill. Cotton fabric is dried over steam heated rolls, to the desired moisture level. It is friction-coated with the compound (0.6 mm thickness) with proper nip setting of the 3-roll calender. The coated fabric is interleaved with liner cloth.

(contd..18.2)

(b) Preparation of rubberised fabric:-

The coated fabric is cut at 45° bias, at desired width, throughout the length. The cut-plies are joined end-to-end transversely, to form a strip of required length.

(c) Hose building:-

The liner tube is introduced pneumatically, on the mandrel, with the aid of talc.

The prepared fabric strip is brushed with petrol and rolled around the liner tube on the mandrel, (2 plies).

G.I. wire (12 s.w.g.) is spiralled under tension, over the plies at a constant spacing of 18 mm. The spiral is coated with rubber solution.

A calendered rubber strip (filler ply) is applied over the wire spiral and consolidated by rolling with edge-wheels.

Coated fabric strip is rolled around the filler-ply in 2 plies.

The cover strip is wrapped around the fabric plies and consolidated by rolling.

A flange is built on to the body of the hose, at either end, with alternate layers of rubber-compound-discs and coated fabric strips. The built flanges are bolted in between M.S. flange rings.

A wet fabric tape is spiralled under tension around the cover. A spiral wrapping with cotton rope is given to consolidate the areas between the wire spiral. (This wrapping gives the corrugated appearance to the finished

(contd...19.)

hose). A wet cotton strip is wound over the flange ends also.

(d) Curing:-

Vulcanization is done in the horizontal autoclave at a steam pressure of 45 to 50 p.s.i. for 2 hrs.

(e) Ejection, Inspection and Testing:-

The cured hose is released from the mandrel using compressed air, inspected for defects if any, the dimensions are noted and tested for proof-pressure on the hydraulic testing equipment.

(f) Packing & Despatch:-

The hoses are packed in hessian, marked, labelled and despatched.

(Details of flow process-chart are given in the appendix 2)

D 1. PRODUCTION PROGRAMME:

Schedule of work:-

At 100% capacity of work, an annual production of 37800 metres of hose is expected.

Assuming 300 working days per year, a daily schedule for 126 M. is made; as shown below:-

Type	I. D. (mm)	Length of one piece (M)	Nos.	Total length (M)
Armoured hoses	50	6	10	60
	75	6	5	30
	100	3	1	3
	150	3	1	3
Plain rubber hoses	25	7.5	2	15
	19	7.5	2	15
Total daily production			=	126 metrs.

(contd....20)

The above scheme leads to the following requirements:-

Daily requirement of compound (a) for liner tube, filler & cover plies	262 Kg.
Daily requirement of compound (b) for rubberising the fabric	28 Kg.
T o t a l :	290 Kg.

Work in 2 shifts per day, each of 8 hrs. duration is sufficient to meet the above needs.

D2. Quality Control Measures:-

It is extremely important that the Chemicals S & D hoses should meet the required specifications strictly. Any failure in doing so, would result in total rejection from service, which would adversely affect the producer, since each piece is comparatively costlier. Hence, quality should be maintained from the raw material purchasing stage to the packing and despatch of finished goods.

Freshly purchased raw materials should be tested for consistent good quality, as required by the specifications.

Dimensions such as the wall thickness and length of liner tube, coating thickness of rubberised fabric, thickness of filler and cover plies, etc. should be checked frequently and maintained within tolerance limits.

The dimensions of finished products should be within tolerances. The adhesion between lining and cover, between plies and between fabric and cover should be tested

(contd.... 21)

(as per IS : 443) and assured to meet the requirements. Proof pressure testing should be carried out in accordance with IS : 443.

Hydraulic testing pressure = $1\frac{1}{2}$ x Working Pressure.

Working Pressure = $\frac{1}{5}$ x Bursting Pressure.

Bursting Pressure (Designed) = $\frac{1.808 \times T \times N}{D}$ where

T = Strength of fabric for 25 mm. width(kg/cm)

N = Number of plies.

D = Mean ply diameter (cm)

Indian Standard Specifications:-

IS : 7654 - 1975 - Chemical Delivery Hoses

IS : 4388 - 1967 - Cotton fabric for reinforcement of rubber hoses

IS : 3549 - 1965 - Water S & D Hoses; Heavy duty.

In addition, the hoses should be made as per the the customer's specific requirements in size, temperature resistance, Chemical resistance, pressure rating etc.

D.3. Utilization of scrap:

Scrap during process can be reduced to a greater extent by careful handling. The strips of rubber plies can be either reprocessed or used along with strips of rubberised fabric for reinforcing the flange portion. Loss of material during mixing, extrusion and calendering should also be brought down to the minimum.

(contd .... 22)

D.4.D Waste disposal:

It is very difficult to dispense with the defective product, once it arises. Hence special care is to be taken to prevent chances of failure at the lining, plies, cover or the flange-ends; by giving adequate reinforcement. The dictum "Prevention is better than cure" is very well applicable to heavy duty hose manufacture.

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E. SELLING AND DISTRIBUTION

E. SELLING AND DISTRIBUTIONS:-

1. Pricing and Sales Programme.

(a) Pricing:- The price of the product is fixed, considering the following factors:-

(i) The price should be comparable to that of the competitive products in the market

(ii) The price should be proportional to the existing demand for the product; and

(iii) It should bring a marginal profit over the total production cost.

With the above aspects in view, the basic prices are fixed for armoured hoses and plain-delivery hoses in different size ranges. (~~See annexure-I~~) (The basic prices are fixed a little below that of the current market prices, to get an initial footing in the market).

These prices are exclusive of Central Exise Duty @ 26.25%, and Sales Tax (K.G.S.T.) @ 10%.

Packing and forwarding charges and insurance charges will be extra.

These prices are subjected to slight variations with time according to the variations in raw material cost, working expenses, etc.

(b) Sales Programme:-

The product is sold, based on the following terms and conditions:-

(a) The finished product would be suppliedto the customer's stores, within one month of getting a firm order.

(contd..... 24)

(b) A period of one month's guarantee is assured to the heavy-duty hoses during in-plant service.

In case of failures if any, during the period the product would be replaced free of cost.

(c) 30% of the cost of the product should be given at the time of despatch and the rest on the completion of the guarantee period.

(d) The customers have the right to inspect the quality control measures of the firm.

(e) Financial transactions are to be made through the bank.

E.2. SELLING ARRANGEMENTS:-

A small scale manufacturer may not be able to afford the expenses involved in opening sales depots at the onset of functioning. Hence, a personal selling strategy is adopted at the initial stages. Under the guidance of the Sales-Manager, the sales agents can canvas orders from the wide range of customers.

E.3. CHANNELS OF DISTRIBUTION:

Long-term contract with K.T.C. can be made for the distribution of the product within the State.

For sales outside the state, railway facilities would be utilized. (The product would be charged F.O.R. Destination).

The product could also be distributed through sole-selling agents in the line.

(contd....25)

F. CAPITAL REQUIREMENTS

F. CAPITAL REQUIREMENTS:

1. Fixed Assets:

The fixed assets of the firm would be as follows:-

a) Land and building - Rented.

b) Plant and Machinery including miscellaneous assets such as furniture, Office equipments etc. - Rs, 5,70,000/- (basic cost).

The initial capital expenditure on fixed assets would be as follows:-

i) Plant and Machinery = Rs,5,70,000/-

ii) Sales Tax, Insurance, Freight, Packing, Erection etc; 10% as above = Rs. 57,000/-

iii) Contingencies (3% on machinery to cover the possible escalation in their cost) = Rs. 18,810/-

iv) Preliminary and pre-operative expenses (registration fee, documentation charges etc. = Rs. 20,000/-

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∴ Expenditure on Plant & Machinery = Rs.6,65,810/-

(Details given in annex I)

2. Working Capital:

As shown in annexure II, the total annual Working capital requirement, (at 100% capacity utilization) would be Rs.25,31,787/-.

∴ For 2 months, the working capital requirement. =Rs,4,21,965/-

∴ Total capital expenditure for fixed assets and working capital =Rs. 10,87,775/-

---

(contd....26)

G. FINANCING PLANS

G. Financing Plans:-

Below are listed, a few of the sources of financial assistance available at present.

(i) Kerala State Small Industries Corporation.

K.S.S.I.C. offers machinery on hire-purchase on a margin money deposit of 20%. Repayment is to be started after 2 years and completed within 7 years.

(ii) Commercial and Nationalised Banks.

Nationalised banks provide cash loans for machinery on 25% margin money. For working capital, any amount can be drawn. (Interest 15%).

(iii) The Kerala Financial Corporation (K.F.C.).

K.F.C. provides financial assistance for starting new industrial units at a low rate of interest and with longer repayment period.

K.F.C's special scheme include:-

(a) Technocrats assistance scheme, which provides 90% of the fixed cost of the project, subject to a maximum of Rs.5 lakhs. Repayment period is 10 to 12 years. For small scale industrial units in non-backward districts, an interest rate of 13.35% per annum is levyied with 1½% rebate for prompt repayment.

(b) Scheme for providing seed capital to new industrial units in small scale sector.

This project is expected to be financed as follows:-

(1) Term loan should be borrowed from K.F.C. for 66% of the fixed cost.

(2) ~~60%~~ 24.7% of the working capital requirement is to be met from nationalised banks.

(contd ..... 27)

(3) The rest of the expenses are met with the promoter's personal funds.

(4) The firm can also be financed internally by ploughing back the profits, annually.

The scheme is expected to be financed in the following pattern:-

Loan from K.F.C.	=	Rs. 4,40,000/-
Loan from Banks	=	Rs. 4,00,000/-
Contribution of promoters	=	Rs. 2,47,775/-
Total Capital investment	=	Rs. 10,87,775/-

The personal funds include:-

Margin money for Working Capital	=	Rs, 21,965/-
Funds for machinery and preliminary & pre-operative expenses	=	Rs. 2,25,810/-
T O T A L	=	Rs. 2,47,775/-

The short term loan from banks for working capital amounts to 94.7% of the total requirement for two months.

The term loan from K.F.C., covers 66% of the amount required for initial capital expenditure on plant, machinery and other needs.

G.2. <u>FOREIGN EXCHANGE REQUIREMENTS</u>:-

There is no need for foreign exchange as all raw materials and machinery are indigenously available.

(contd.. 28)

G.3. CASH FLOW ANALYSIS:

THE Cash Flow Statement, showing the working of the unit, during the first 5 years of operation is provided in Annexure VI. The expected cash balance is Rs.6.188 lakhs at the end of the first hear, which will increase to Rs.16.734 lakhs by the end of the fifth year. It is assumed that the unit will not avail any additional working capital finance during the second, third, fourth and fifth year of operation. The repayment of loan could be made in four equal instalments of Rs. 2.100 lakhs each, from the second year onwards.

The cash position of the unit is quite satisfactory. The unit may be able to accelerate the repayment of loans and to envisage further expansion and diversification.

(contd .. 29)

H. PROFITABILITY ANALYSIS

H. PROFITABILITY:

1. Level of Operation:-

The unit is capable of providing 37800 M. of Chemicals S & D hoses, if it works at 100% capacity utilization. This amounts to a sales-revenue of Rs.33,93,000/- per year. (as shown in appendix VI). But it is assumed that the unit would work at 60% capacity utilization on the first year, 70% on the second year and 80% from 3rd year onwards.

Operating at this level, the unit can build up adequate resources to pay-back the borrowed funds and to result good returns. (Details given in annexure IV).

Break - Even Analysis:-

The Break Even level of production is determined graphically (appendix VII); from the following data:-

Fixed costs = Rs. 6.658 lakhs.

Period	Annual Production (M).	Variable Cost (Rs. in lakhs)	Total cost (Rs. in lakhs.	Sales (Rs. in lakhs)
Ist Year.	22680	9.022	15.680	20.358
2nd Year	26460	13.456	20.114	23.751
3rd Year	30240	14.899	21.557	27.144

At the Break Even Point,

Annual production = 17000 metres.

" Sales turnover = Rs. 15,24,600/-

==========

It is observed that the firm could function with a fairly good 'margin of safety' from 3rd year onwards.

(contd.....30)

H.2. PROFITABILITY RATIOS:

The important operation results of the unit, anticipated at the end of 5th year at 80% capacity are given below:-

(i)	Annual Sales turn-over	= Rs. 27,14,400/-
(ii)	Annual net profit	= Rs. 5,55,543/-
(iii)	Own funds, invested	= Rs. 2,47,775/-
(iv)	Total capital employed	= Rs. 10,87,775/-

(a) Rate of return on own funds = 2.25 : 1

(b) Rate of return on Capital employed = 0.51 : 1

(c) Percentage of net profit on Sales turn-over = 20.46%

(contd.. 31)

I. ECONOMIC VIABILITY

I. ECONOMIC VIABILITY:

1. Repayment of borrowed funds:-

The loans borrowed from financial institutions for the purchase of machinery and working-capital requirement are expected to be paid back according to the following scheme:-

i) The loan from K.F.C. worth Rs.4,40,000/- would be paid back in 4 instalments of Rs.1,10,000/- each, starting from the second year of production.

ii) The loan from banks, worth Rs.4,00,000/- can be paid back in 4 equal instalments of Rs.1,00,000/-each.

2. Pay-back period:

Pay-back period is defined as the length of time required to receive benefits equivalent to the initial investment.

Pay back period for this scheme is determined as shown below:-

	Ist Year	2nd Year	3rd Year	4th Year	5th Year
Annual net profit Rs.	421032	327297	502803	529173	555543
Provision for depreciation Rs.	62700	62700	62700	62700	62700
Annual Surplus Rs.	483732	389997	565503	591873	618243

From the above table, it can be seen that the annual surplus would become equal to initial capital investment by a period of 2 years and 1½ months. (Obtained by interpolation)

Hence the pay-back period = 2 years 1½ months.

(contd.. 32)

J. SOCIAL BENEFITS

J. ASSESSMENT OF SOCIAL (NATIONAL) BENEFITS:

The project, mentioned above is capable of providing the following benefits in the long run:-

1. It gives a very nice opportunity to the enterpreneur to utilize his resources and talents effectively.
2. This could satisfy a good share of the growing demand for the product in the chemical and allied industries. In addition, the enterpreneur can achieve personal profits through customer satisfaction'.
3. This could enhance the nation's revenue earnings through taxes, excise duty etc.
4. By providing new employment opportunity, this firm would be of assistance to the state in solving the problem of unemployment.

(contd,, 33)

K. CONCLUSION

K. CONCLUSION:

The project, discussed above has got the following main features:-

Product - Chemicals Suction & Discharge Hoses.

Location - An Industrial Estate at Ernakulam.

Cost of the Project:-

Fixed investment	Rs. 6,65,810/-
Working capital required.	Rs. 4,21,965/-
Total investment	Rs.10,87,775/-

Pattern of investment:

Loan from financial institutions	Rs. 8,40,000/-
Personal funds	Rs. 2,47,775/-
Annual production (on 5th year, at 80% capacity utilization)	30240 metres.
Sales turn over	Rs.27,14,400/-
Net profit after tax	Rs. 5,55,543/-
Rate of return on total investment =	51%
Break even production =	17000 metres.
Pay back period =	2 yrs. 1½ months.

(contd.. 34)

L. ANNEXURES

K. ANNEXURE : I

DETAILS OF FIXED ASSETS:

(a) Plant and Machinery.

Sl. No.	NAME	No. off.	Size and details	Cost Rs.	H.P.
1.	Mixing mill	1	14" x 36" with accessories.	120000	40
2.	Extruder	1	4½" complete with drive.	60000	20
3.	Calender	1	8" x 24", 3 roll with accessories.	100000	30
4.	Vulcanizer (Horizontal autoclave.)	1	2' x 62', complete with trolley and rail arrangement.	80000	--
5.	Platform balance	1	Capacity-to weigh 300 kg.	5000	--
6.	Dial balance	1	to weigh 10 kg.		
7.	Mandrels	-	30m. length; different sizes.	10000	--
8.	Air compressor	1	W.P. = 100 psi	40000	15
9.	Boiler	1	Steam - 500 kg/hr. at 7.5 kg./cm^2, suitable for wood firing with blower, base-exchange unit etc.	50000	10
10.	Tables	1	61' x 3' x 3' with rotatable chucks, complete with drive.	12000	10
		1	61' x 3' x 3' without rotatable chucks and drive.		
11.	Testing equipments	-	Hardness tester,	10000	
			Proof pressure tester		25
			Ply-adhesion "		5
			Gauges etc.		
12.	Bench grinder	1	-	2000	1
13.	Fabric drying rolls	1	-	5000	-
14.	Pump set	1	with 3 H.P. motor & pipes.	6000	3
15.	Electrical installations, Transformer etc.	-	-	50000	-
16.	Tools & accessories	-	-	5000	-
17;	Miscellaneous assets	-	Furniture, Office equipments etc.	15000	-
			Total	570000	159
	Sales tax, Insurance, Freight, Packing Erection etc. at 10%			57000	
			GRAND TOTAL	Rs.627000/-	

(contd.. 35)

Annexure I contd.

No.	PARTICULARS	COST
		Rs.
1.	PLANT AND MACHINERY	6,27,000/-
2.	CONTINGENCIES (3% on Plant and Machinery).	18,810/-
3.	PRELIMINARY & PRE-OPERATIVE EXPENSES.	20,000/-
	TOTAL CAPITAL EXPENDITURE ..	6,65,810/-

A N N E X U R E - II

WORKING CAPITAL COMPONENTS (For 2 months)

Annual requirements:

No.	PARTICULARS	Amount Rs.
1	RAW MATERIALS	10,89,200
2	SALARY AND WAGES WITH 30% ADDITIONAL BENEFITS.	3,30,720
3	UTILITIES (Power, Water & fuel)	3,06,000
4	OVER HEADS (Maintenance, Interests and taxes, administrative & Sales expence, etc.)	8,05,867
	TOTAL	Rs. 25,31,787

Working Capital requirement for 2 months. Rs. 4,21,965/-

(contd..... 36)

A N N E X U R E : III

DETAILS OF WORKING EXPENSES AND OTHER COSTS:

(a) **RAW MATERIALS (ANNUAL REQUIREMENTS)** (100% capacity utilization).

(i) **Rubber Chemicals:-**

Materials	Quantity kg.	Price Rs/kg.	Cost Rs.
Natural Rubber	30895	12.00	3,70,740/-
ZnO	1546	16.00	24,736/-
Stearic acid	602	15.50	9,331/-
F.E.F.	1381	14.00	19,334/-
G.P.F	84	13.00	1,105/-
Barytes	28265	0.80	22,612/-
China Clay	15450	0.60	9,270/-
Spindle Oil	3090	8.50	26,265/-
C.I. Resin	690	22.00	15,180/-
Pine tar.	230	6.00	1,380/-
P.B.N.	301	50.00	15,050/-
Sulphur	766	3.50	2,681/-
M.B.T.S.	245	60.00	14,700/-
T.M.T.	45	42.00	1,890/-
Ethylene Glycol	232	12.00	2,784/-
		TOTAL COST =	5,39,112/-

SAY Rs. 5,39,200/-

(contd.. 37)

Annexure III contd.

(ii) CONSUMABLES:

Cotton fabric to be rubberised 30000 m^2 @Rs8/m^2	Rs,	2,40,000/-
G.I. Wire (12 SWG) - 20000 kg; @ Rs. 6/kg.	Rs.	1,20,000/-
M.S. Plate - flange rings - 12000 nos @ Rs. 15/piece	Rs.	1,80,000/-
Miscellaneous - (Dusting powder, petrol, soap Lubricating oils, packing cloth etc.)	Rs.	10,000/-
Total cost	= Rs.	5,50,000/-
Annual cost of Raw materials	= Rs.	10,89,200/-

3.(b) UTILITIES (ANNUAL REQUIREMENTS) (100% capacity utilization)

(1) ELECTRICITY

Estimated connected load	= 160 H.P. or 120KW.
Assuming 80% efficiency daily maximum consumption (in 2 shifts), for the machines.	= 718 KWH.
Add: 10% for lighting, fans and other non-industrial purposes	= 72 KWH.
Total	= 790 KWH.
Maximum daily power consumption, giving allowance for wastage	= 800 KWH
Annual requirement of power	= 800 x 300 =240000 KWH
Annual power charge at Rs.0.15 per unit.	= Rs.36,000/-

(CONTD .. 38)

2. FUEL.

Fire wood is used as the fuel for boiler. Daily maximum steam - output required is 5000 kg. at 50 p.s.i. Assuming a Calorific value of 4000 cals/kg. and 70% fuel efficiency for boiler,

Daily firewood requirement	= 2000 kg.
Annual " "	= 600 tonnes.
Fuel cost at Rs.150/tonne.	Rs = 90000/-

3. W A T E R.

Water requirement for boiler, mixing mill, calender and extruder per day	= 10000 lr
Personal and general purpose	= 2000 lr
Total	12000 lr.
Annual water requirement	= 3600000 lr = 3600 klr
annual water charge @ Rs.50/klr	= Rs.1,80,000/-
Total annual charge for utilities	= Rs.3,06,000/-

(contd.. 39)

ANNEXURE III

3.C. MAN POWER REQUIREMENTS:

1) Distribution in shifts:-

Personnel	Working shift	Labourers/shift			Total per day
		U.S.	S.	Others	
1. Labourers.					
Compounding	2	1	1	-	4
Mixing	2	1	1	-	4
Extrusion	2	2	1	-	6
Calendering	2	3	1	-	8
Fabric preparation	2	-	1	-	2
Building & Curing	2	8	4	-	24
Packing	1	1	-	-	1
Store	1	-	1	-	1
Boiler & Compressor	1	-	1	-	1
Attendent	1	-	-	1	1
2. Technical & Supervisory:					
Production Manager	1	-	-	1	1
Process Supervisors	2	-	-	1	2
3. Administration, Accounts And Sales.					
Accountant	1	-	-	1	1
Typist/clerk	1	-	-	1	1
Attendent	1	-	-	1	1
Sales Manager	1	-	-	1	1
Sales agents	1	-	4	2	2
Total		31	20	10	61

(contd 40)

Annexure III contd,

3.c. (2) REQUIREMENTS OF PERSONNEL & THEIR REMUNERATIONS:

Designation	No.	Rate Rs./month	Monthly pay Rs.
Sales Manager	1	800	800
Sales Agents	2	500	1000
Production Manager	1	900	900
Accountant	1	600	600
Typist/Clerk	1	400	400
Attendent	2	200	400
Process Supervisors.	2	400	800
Skilled Workers.	20	350	7000
Un-skilled workers.	31	300	9300
Total	61	-	21200

Total monthly pay	=	Rs. 21,200/-
.'. Annual salary	=	Rs. 2,54,400/-
Addl. benefits (30% of salary)	=	Rs. 76,320/-
Total annual pay	=	Rs. 3,30,720/-

(contd... 41)

Annexure III contd.

3.d. OTHER COSTS:

PARTICULARS	AMOUNT Rs.
Depreciation @ 10% on machinery	62,700.00
*Interest on loan for machinery @13% per yr.	57,057.00
*Interest on loan for Working Capital @ 15%	60,000.00
Loan repayment	2,10,000.00
Maintenance @ 2% on machinery	12,540.00
Rent on building	12,000.00
Insurance @ 1% on Plant & Machinery.	6,270.00
*Contingencies.	12,000.00
Total	4,32,567.00

* Variable expenses.

3.e. Administration and Sales expenses:

(1) Administration expenses:-

Postage and Telegrams	=	Rs. 12,000.00
Travelling and Publicity	=	Rs. 10,000.00
Printing and Stationary	=	Rs. 12,000.00
Total		Rs. 34,000;00

(2) Sales expenses:

Sales commission and Selling expenses @ 10% on annual sales-turn over = Rs.3,39,300/- (at 100% Capacity utilization).

3.f. Taxes - @ 10% on Gross Profit.

(contd .. 42)

A N N E X U R E - IV

PROFITABILITY (STATEMENT FOR 5 YEARS):

	Ist year	2nd year	3rd year	4th year	5th year
No. of Working days	300	300	300	300	300
Capacity Utilization	60%	70%	80%	80%	80%
Production in metres	22680	26460	30240	30240	30240
A. Sales Turn-over	Rs 2035800	Rs 2375100	Rs 2714400	Rs 2714400	Rs 2714400
B. Cost of Production					
1. Raw materials	653520	762440	871360	871360	871360
2. Utilities	183600	214200	244800	244800	244800
3. Wages and Salaries + 30% benefits.	330720	330720	330720	330720	330720
4. Other costs:					
Depreciation	62700	62700	62700	62700	62700
Interest on loan for machinery.	57057	57057	42900	28600	14300
Interest on loan for working capital.	--	60000	45000	30000	15000
Repayment of loan	--	210000	210000	210000	210000
Maintenance	12540	12540	12540	12540	12540
Rent	12000	12000	12000	12000	12000
Insurance	6270	6270	6270	6270	6270
Contingencies.	12000	12000	12000	12000	12000
5. Administration expenses	34000	34000	34000	34000	34000
6. Sales expenses	203580	237510	271440	271440	271440
Total expenses	1567987	2011437	2185730	2126430	2097130
C. Gross Profit (A — B)	467813	363663	558670	587970	617270
Taxes	46781	36366	55867	58797	61727
D. Net Profit	421032	327297	502803	529173	555543

(contd... 43)

A N N E X U R E - V

CASH FLOW CHART (Rs. in lakhs)

	Construction Period	Ist Year	2nd Year	3rd Year	4th Year	5th Year
A. Source of Funds						
1. Own Funds	2.478	--	--	--	--	--
2. Loan from K.F.C.	4.400	--	--	--	--	--
3. Profit before Tax with interest added back.	..	4.912	3.819	5.866	6.174	6.482
4. Depreciation	..	0.627	0.627	0.627	0.627	0.627
5. Loan from Bank.	..	4.000	--	--	--	--
Total of A	6.878	9.539	4.446	6.493	6.801	7.109
B. Disposition of funds:						
1. Capital expenditure	6.658	--	--	--	--	--
2. Increase in working capital.	--	2.532	0.422	0.424	--	--
3. Repayment of loan.	--	--	2.100	2.100	2.100	2.100
4. Interest for loans.	..	0.571	1.171	0.879	0.586	0.293
5. Taxes.	--	0.468	0.364	0.559	0.588	0.617
Total of B.	6.658	3.571	4.057	3.962	3.274	3.010
Opening Balance	--	0.220	6.188	6.577	9.108	12.635
Net Surplus (A — B)	0.220	5.968	0.389	2.531	3.527	4.099
Closing Balance	0.220	6.188	6.577	9.108	12.635	16.734

(contd .. 44)

M. APPENDICES

APPENDIX - I

FORMULATIONS:

(i) Compound (a) - For Liner tube, filler and cover plies.

Materials	parts/weight
Natural Rubber	100
Zinc Oxide	5
Stearic acid	2
F.E.F.	5
Barytes	100
China Clay	50
Spindle oil	10
C.I.Resin	2.5
P.B.N.	1
Sulphur	2.5
M.B.T.S.	0.80
T.M.T.	0.15
Ethylene Glycol	0.75

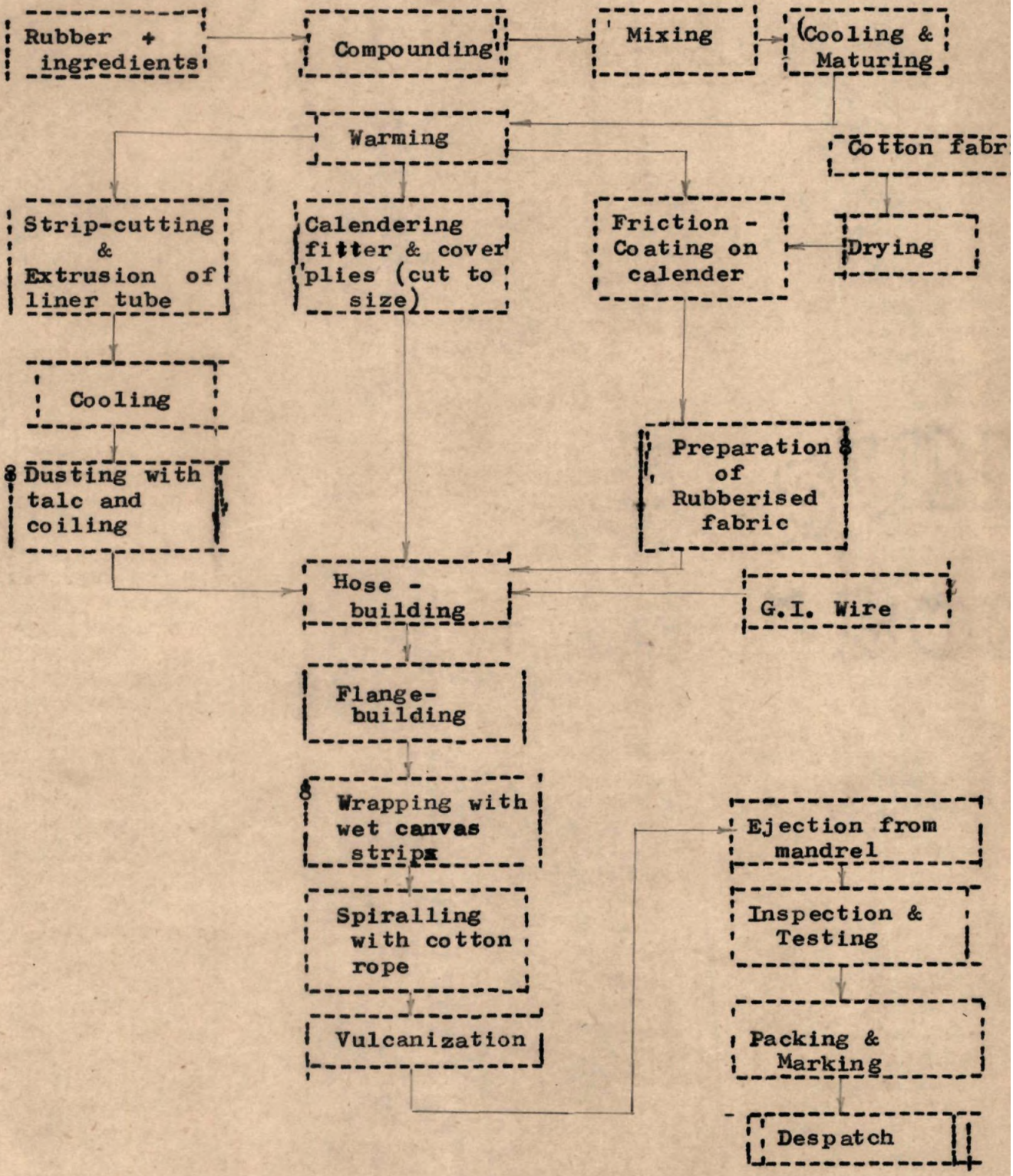
(ii) Compound (b) - For Fabric coating:

Materials	Parts/weight.
Natural rubber	100
ZnO	5
Stearic acid	1.5
G.P.F.	2.5
Barytes	20.0
China Clay.	50.0
Whiting	50.0
Spindle oil.	10.0
Pine tar	7.0
P.B.N.	0.75
Sulphur	2.25
M.B.T.S.	0.70
T.M.T.	0.10
Ethylene Glycol	0.75

(contd.. 45)

APPENDIX - II

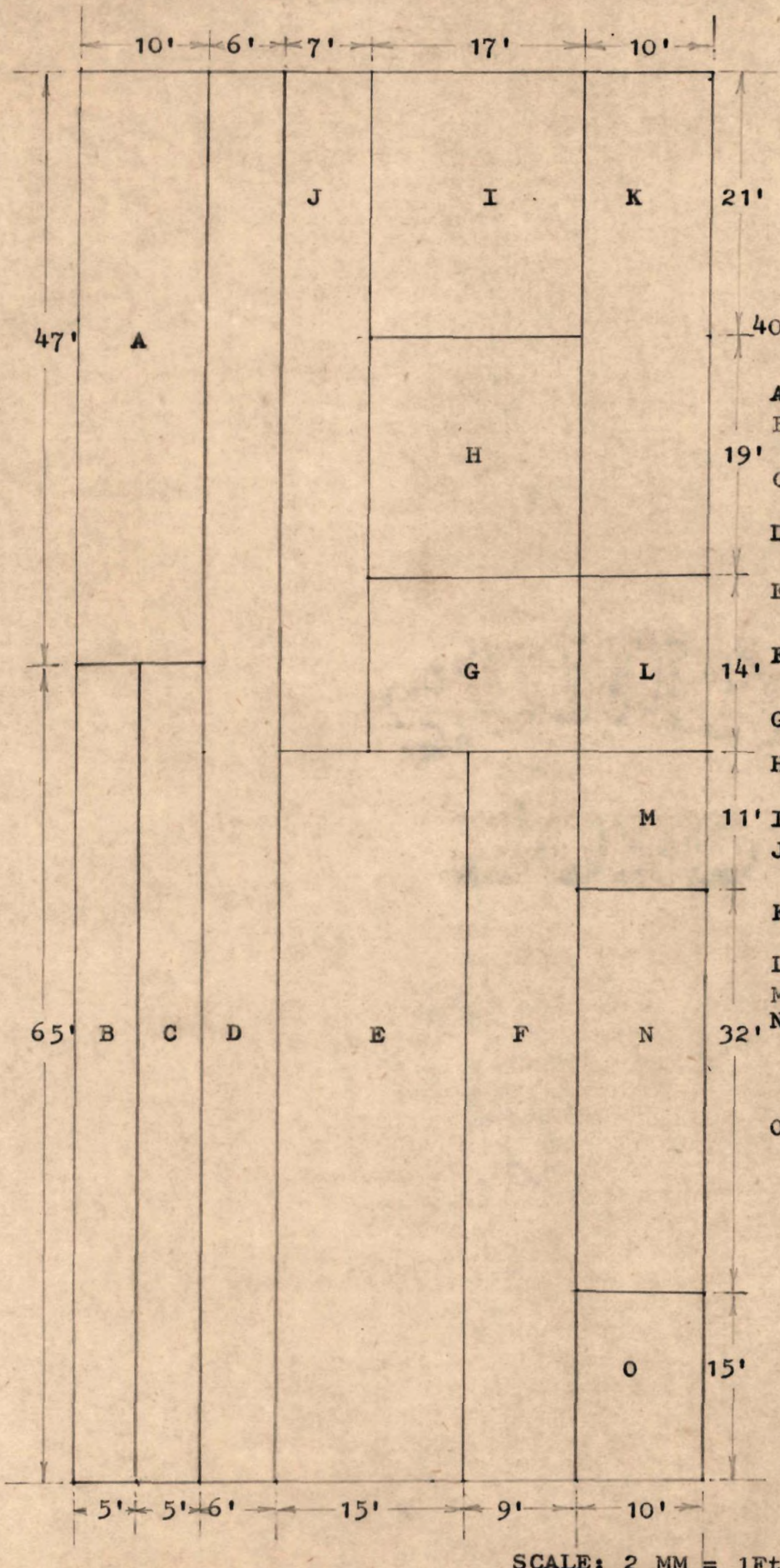
PROCESS FLOW CHART



(contd.... 46)

APPENDIX -III

LAYOUT OF THE PLANT (50' x 112').



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K. RAW-MATERIAL STORE.
L. COMPOUNDING
M. MATURING
N. COMPRESSOR, BOILER & PUMP.
O. TOILET.

SCALE: 2 MM = 1Ft.

A P P E N D I X -IV

MACHINERY SUPPLIERS:

1. SOHAL ENGG. WORKS,
   H.O. Sohal Industrial Estate,
   L.B. Shastri Marg,
   Bhandup, BOMBAY - 400 078.

2. Farrel Anand Machinery Mfgrs., Ltd.,
   Mahalaxmi Chambers,
   22, Bhula bhai Desai Road,
   BOMBAY - 400 026.

3. Richardson & Cruddas Ltd.,
   L.B. Shastri Marg, Mulund,
   BOMBAY - 400 080.

4. Indian Expeller Works Pvt., Ltd.,
   A/4, Naroda Industrial Estate,
   Naroda, Ahmedabad - 382 330.

5. Kelachandra Iron & Steel Works,
   Chingavanam,
   Kottayam,
   Kerala 686531.

6. Batliboi & Co. Pvt. Ltd.,
   V.B. Ghandhi Marg, Fort,
   Bombay - 400 023.

7. Branch: Bhatliboi Machinery divn.,
   P.B. No. 1719,
   M.G. Road, Ernakulam,
   Cochin 682016

8. Premier Scientific Sales Pvt. Ltd.,
   16, Patel Road, South Patel Nagar,
   P.B. No. 6057, NEW DELHI - 8.

9. Rehash General Agencies,
   501-C/2, Poonam Chambers,
   Shivasagar Estate,
   Dr. Annie Besant Road,
   Worli, Bombay 400 018.

10. Concord Industments Pvt. Ltd.,
    XXXV/459-2, Warriam Road,
    Ernakulam, Cochin 682016.

(contd .. 48)

APPENDIX - V

RAW MATERIALS SUPPLIERS

1. Alkali and Chemical Corporation of India Ltd.
(Chemical dept.), P.B. No. 909334
Chowringhee Road,
Calcutta - 71.

Branch: 'P.C. Chacko'
P.B. No. 89, Baker Jn.
Kottayam.

2. Bayer (India) Ltd.,
(Rubber division), Express Towers,
Nariman Point, P.B. No. 1436,
Bombay - 400 021.

3. ~~--Rube-~~ Branch: Chemical Trading Co.,
XXXV/1365, M.G. Road,
P.B. No. 1831, Cochin - 16.

3. Rubochem Industries Pvt. Ltd.,
1005, Prasad Chambers,
10th Floor, Near Roxy Cinema,
Bombay - 400 004.

Branch: Rubo Chem
C.M.S. College Jn
Kottayam.

4. Samira Enterprises,
11-Sagar, 3rd Floor,
327 - Narsi natha St.,
Bombay.

Branch: - Samira Enterprises,
Kalarikkal Bazaar,
Kottayam 686001.

5. Lubricants Chemicals Pvt. Ltd.,
Rehash General Agents (Stockists),
501 C/2, Poonam Chambers,
Dr. Annie Besant Road,
Worli, Bombay.

Branch:-
Lubricants & Chemicals Pvt. Ltd.
Rammohan view,
cochin 682 011.

6. Phillips Carbon Black Ltd.,
31. Netaji Subhash Road,
Calcutta - 1.

7. Hindustan Petroleum Corpn., Ltd.,
Jamashedji Tata Road,
Bombay - 400 020.

8. MADURA COATS (Ltd)
425, Pantheon Road,
Madras. 600 008.

(contd.. 49)

A P P E N D I X - VI

PRODUCT LINE & SALES REALISATION

(100% CAPACITY)

PARTICULARS	I.D. (mm)	Price Rs/m.	Annual production (m)	Annual sales Rs.
ARMOURED HOSES	50	100	18000	1800000
	75	120	9000	1080000
	100	150	900	135000
	150	170	900	153000
PLAIN HOSES	25	30	4500	135000
	19	20	4500	90000
Total			37800 m	Rs. 3393000/-

Average price per metre = Rs. 89.80.

(contd 50)

APPENDIX VII

BREAK EVEN CHART

SCALE:-*

1CM=5000M(X-AXIS)

1CM=Rs.500000/-(Y-AXIS)

I N D E X:

F.C. - FIXED COST

T.C. - TOTAL COST

S - SALES

P.A. - PROFIT AREA

L.A. - LOSS AREA.

B. - BREAK-EVEN POINT.