UNIVERSITY OF COCHIN

B.Tech., Course

In Rubber Processing And Technology

PROJECT REPORT

ON A SMALL SCALE UNIT

MANUFACTURING MICROCELLULAR SOLES

IN KERALA

DISSERTATION REPORT

Submitted by,

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Valued Comments

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Section I

INTRODUCTION

Microcellular rubber soling based on high styrene resins and expanded by means of an organic blowing agent have gained considerable popularity in India. The simple definition of the term 'Microcellular rubber' is that it is a rubber made up of a cellular structure, which is so fine that it can only be conveniently seen with the aid of a lens. Microcellular rubber soling containing minute air cells and having a specific gravity as low as 0.3 is also used extensively. The main advantages offered by Microcellular rubber solings are

(1) Light in weight ie low in density
(2) Minimum abrasive wear for long life
(3) Long flex life
(4) Versatility of hardness range ie from very soft to hard.
(5) As durable as leather.

The recent trend is to use hard microcellular rubber soling for shoes and medium hard for chappals with leather or other type of uppers, soft and very soft for Hawai or beach sandles.

Prospects.

Hawai slippers and leather chappels with microcellular solings have become very much popular in the Indian foot wear industry. Because of its properties it has practically replaced leather as a soling medium in footwear manufacture. Foot wear

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based on microcellular soling are still getting more and more popular and the demand for this type of footwear is continuously increasing.

The vast population of the country and increased use of footwear due to improved standards of living of the people are the two main reasons for the rapid development of the rubber footwear industry.

The manufacturing unit for this type of product can be started as a Small Scale Industry. All the machinery and raw materials required are indigenously available. Skilled labour is required only to a very small extent. The plant can be diversified using the same basic equipment and machinery to manufacture, straps, and moulded goods.

Section II

Market Survey.

The Indian rubber footwear industry constitutes the largest segment of the non tyre products manufacturing industry. At present 12-13% of the total rubber is consumed for the manufacture of rubber footwear. There are about 20-25 organised units manufacturing footwear of various kinds and verities. Indian footwear industry manufactures a wide range of footwear including rubber, canvas/leather upper and rubber soles etc. of different shape and fashions. In addition to the above units there about 250 small units manufacturing microcellular chappals and soles, heals and straps. These units are more concentrated in the Punjab and Haryana states. It is found that as against per capita consumption

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of 4 pairs in the U.S.A. 2.7 pairs in Japan and 2.2 pairs in U.K. it is only less than 0.5 pairs in India.

Nearly 12.5% of the total rubber consumed is used for the manufacture of rubber footwear. Therefore nearly 20,000 tons of rubber is consumed annually by the Indian footwear manufacturing Industry. The production of rubber footwear in the year 1974-75 is estimated to be 72 million pairs.

The actual and estimated production during 5 years before and after 1969 respectively is given table No. I.

Year.	Million pairs.
1960	44.66
1964	47.04
1965	53.04
1966	52.15
1967	54.56
The estimated production during 1968 - 1973	
1968 - 69	60.00
1969 - 70	65.00
1970 - 71	71.00
1971 - 72	77.00
1972 - 73	84.00
1973 - 74	90.00

But the actual production during 1968 to 1974 was considerably less than this. This is because of the penetration of plastic

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footwear like P.V.C. But after 1973 due to the resin shortage and due to the increased price of plastic material the growth of plastic footwear has considerably decreased. This is very well reflected in the increased demand and use of rubber footwear.

Demand in 1978-79	100 million pairs.
Existing capacity	75 "

The above demand and capacity shows the actual potential for the expansion of footwear industry.

Statistics regarding the number of units manufacturing Microcellur soles in Kerala.

Number of Units.	22
Production (Rs. lakhs)	120
Capacity (Rs. lakhs)	150

Growth rate of footwear industry.

In order to meet the demand of the local and export markets the footwear manufacturing industry has got a very good growth potential. The calculated growth rate is about 10% per annum. If we look at the demand for footwear in terms of India's population we can clearly understand the potential growth.

Let the replacement rate of footwear for 25% of India's population (65 crores) be 1 pair per person/annum. Then about 160 million pairs are needed. This will indicate the actual demand for footwear in India. The actual potential growth for footwear is in the remote area. Besides good increase in growth can be observed if satisfactory growth in the agricultural sector is achieved. This will improve the purchasing capacity of the people

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It is estimated that 7000 Metric Tons of Microcellular rubber is used annually for footwear products. This is approximately equal to 14 million pairs of footwear. Calculating a growth rate of 10% per annum the growth is as follows.

TABLE II.

No.	Year.	Footwear Million pairs.	Rubber consumption (Metric Tons)
1	1974-75	14.00	7,000
2	1975-76	15.40	7,700
3	1976-77	16.94	8,470
4	1977-78	18.63	9,320
5	1978-79	20.49	10,250

Export Market.

Indian rubber footwear exports are comparable in quality with the leading exporters like, Japan, Hongkong and Canada. Indian rubber footwear exports account for nearly 30% of the total rubber goods exported. In 1973-74 India exported footwear worth Rs. 293.7 ~~crores~~ lakhs. From the following table it is clearly understood that the footwear export market is gradually increasing.

TABLE 3

Sl.No.	Year.	Value in lakhs of Rupees.
1	1964-65	121.4
2	1965-66	147.7
3	1966-67	197.5

Contd.....6

Table 3 contd.

Sl. No.	Year.	Value in lakhs of Rupees.
4	1967- 68	163.9
5	1968-69	206.7
6	1969-70	219.1
7	1970-71	231.6
8	1971-72	314.0
9	1972-73	303.6
10	1973-74	293.7

Section III

Location of the plant.

Plant location is determined after considering a number of factors. It has got considerable influence on operating cost and productivity. The important points to be considered in selecting a factory site for microcellular sole production are the following.

(1) Availability of raw materials.

(2) Easy availability of labour, water, and power.

(3) Facilities for transport and communication.

(4) Marketing facilities.

The factory is proposed to locate in Kerala in Kottayam district. The main reasons for locating the plant in Kottayam District is

(1) Easy availability of electricity.

(2) Uninterupted supply of raw natural rubber.

(3) Proximity to other raw materials.

Contd....7

(4) Availability of labour.

(5) Facilities for quick transport and communication.

Section IV

Raw material Requirements.

The raw material requirement is calculated as per the following production pattern given in table No. 4

TABLE. 4.

Product	Annual production.
1. M. C. Sheets.	150 tonnes.
2. Hawai	100 tonnes.
3. Banwar.	50 tonnes.
Total.	300 tonnes.

The annual raw material requirement of each item is calculated as per the typical formulation of each of the above products. The value of the annual requirement of raw material is calculated to be Rs. 17,26,300 and is given in Table No.5. The choice and selection of compounding ingredients depends on the quality and availability and cost aspects. Raw material requirement is calculated below.

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TABLE 5 a.

Raw Material requirement for M. C.

Raw materials.	Rate/ Kg. Rs	Formu-lation	Weight/ 150 Tonnes	Cost. Rs
Natural Rubber.	9.20	60.00	29.130	2,68,000.00
SBR 1941 X	15.00	40.00	19.410	2,91,150.00
China Clay	0.30	120.00	58.260	17,478.00
Calcium Silicate.	2.25	20.00	9.708	21,850.00
Process Oil.	9.00	10.00	4.854	43,686.00
Diethylene glycol.	30.00	1.20	0.600	18,000.00
M. C. Crumb.	1.70	37.00	17.960	30,540.00
St. acid.	12.00	4.00	1.941	23,292.00
Zinc Oxide.	16.00	4.00	1.941	31,056.00
Ureaka White F	35.53	1.10	0.534	18,970.00
TMT	29.54	0.20	0.097	2,865.00
Styrenated Phenol.	23.38	1.00	0.485	11,340.00
Paraffin Wax.	3.00	1.00	0.485	1,455.00
Titanium dioxide	10.00	3.20	1.553	1,553.00
Blowing agent (DPT)	32.00	4.00	1.941	62,100.00
Sulphur.	2.00	2.3	1.117	2,234.00
Total.		309.00	150.010	8,45,569.00
Cure 6 minutes at 150°C				
Process loss (+ 3%)				25,367.00
Total.				8,70,936.00

Contd.....9

TABLE 5 b.

Raw Material requirement for Hawai.

Raw materials.	Rate/ Kg. Rs.	Formul- ation.	Weight/ 100 Tonnes.	Cost. Rs.
Natural Rubber.	9.20	70.00	18.660	1,71,900.00
SBR 1941 X	15.00	30.00	7.466	1,14,700.00
China Clay.	0.30	150.00	40.000	12,000.00
Calcium Silicate.	2.25	36.00	9.601	21,600.00
Process Oil.	9.00	12.50	3.334	30,000.00
Diethylene glycol.	30.00	1.50	0.400	12,000.00
M. C. Crumb.	1.70	50.00	13.330	22,670.00
St. acid.	12.00	6.00	1.601	19,220.00
Zinc Oxide.	16.00	4.00	1.067	17,070.00
Ureaka White F	35.53	1.20	0.320	11,370.00
TMT	29.54	0.15	0.040	1,181.00
Styrenated Phenol.	23.38	1.00	0.267	6,244.00
Paraffin Wax.	3.00	1.00	0.267	800.90
Titanium dioxide	10.00	2.95	0.733	733.00
Blowing agent (DPT)	32.00	6.00	1.600	51,190.00
Colour.	100.00	0.25	0.067	6,700.00
Sulphur.	2.00	2.40	0.640	1,280.00
Total.		375.00	100 .060	5,00,748.00
Cure 6 minutes at 150°C				
Process loss (+ 3%)				15,022.00
Total.				5,15,770-00

Contd....10

TABLE 5 c
Raw Material requirement for Banwar

Raw materials.	Rate/ Kg. Rs.	Formul- ation	Weight/ 50 Tonnes	Cost. Rs.
Natural Rubber.	9.20	50.00	10.00	92,000.00
SBR 1941 X	15.00	50.00	10.00	1,50,000.00
China Clay.	0 .30	82.00	16.42	4,926.00
Calcium Silicate.	2.25	50.00	10.00	22,500.00
Process Oil.	9.00	1.00	0.20	1,800.00
Diethylene glycol.	30.00	2.00	0.40	12,000.00
St. acid.	12.00	2.00	0.40	4,800.00
Zinc Oxide.	16.00	4.00	0.80	12,800.00
Urea ~~A~~ White F.	35.53	0.80	0.16	5,684.00
TMT.	29.54	0.10	0.02	591.00
M. B. T.	26.00	1.00	0.20	5,200.00
Styrenated Phenol.	23.38	1.00	0.20	4,676.00
Titanium Dioxide.	10.00	3.50	0.70	7,000.00
Colour.	100.00	0.25	0.05	5,000.00
S	2.00	1.00	0.40	800.00
Total.		250.00	50.00	3,29, 777.00

Cure 5 minutes at 150°C

Process loss (+ 3%) 9,893.00

Total. 3,39,670.00

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Thus the compound cost would be as follows for different items.

No.	Product.	Tonnes.	Annual cost.	Cost/ M.T. of compound.
1	M.C.	150	8,70,900	5,805
2	Hawai	100	5,15,770	5,157
3	Banwar.	50	3,39,670	6,793
	Total.	300	17,26,340	
	Grand Total(Rounded off)			17,26,300
	∴ Price/M.T.			5,585

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SECTION V

MANPOWER REQUIREMENTS.

TABLE V

Department	Section	Shift	U.S.	S.S.	S.	Others	Expense Rs.
(a) Labour	1) Compounding	2	2	--	--	--	500
	2) Mixing.	2	2	2	2	--	1,800
	3) Curing.	2	4	2	2	--	2,300
	4) Post Curing	2	1	-	-	--	250
	5) Boiler - attendent	2	-	2	--	--	600
	6) Packing and despatch.	1	1	--	--	--	250
	7) Watchman	1	1	--	--	--	250
(b) Supervisors	Production	2	--	--	--	2	1,000
(c) Manager/ Technologist			--	--	--		900
(d) Office	1) Office Manager	1	--	--	--	1	500
	2) Clerk/ Typist	1	--	--	--	1	300
	3) Accountant	1	--	--	--	1	400
	Total.		11	6	4	6	9,050
Other benefits (20%)							1,810
Total per month.							10,860
∴Total per annum.							1,30,300

Salary rate of different group of personnel is given below.

	Skilled	Semi-Skilled	Unskilled	Supervisors.
Rate.	350	300	250	500

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SECTION VI

LAND AND BUILDING

(a) Land.

The total land required is calculated as 1200 Square metres. The cost of 1200 Sq. meters of land is worked out to about Rs. 8400 (Rs. 7 per Sq. meter)

(b) Building.

The built up area required is estimated to be 300 Sq. meters. The cost of the building is calculated as Rs. 350 per Sq. meter.

The total cost of land and Building including site levelling fencing and for approach roads is given in Table No. 7.

TABLE 7

1.	Cost of 1200 Sq. meters of land @ Rs. 7/Sq. m.	8,400
2.	Site levelling, fencing and for approach roads.	2,500
3.	Cost of Building @ Rs. 350/Sq. m.	1,05,000
	Total.	1,15,900

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Approximate area required in each department is given in table No. 8.

TABLE 8

Sl. No.	Section.	Area Sq. meters.
1.	Raw material Storage.	50
2.	Compounding.	40
3.	Mixing.	60
4.	Moulding.	35
5.	Office and Rest room.	85
6.	Post cure.	30
	Total.	300 Sq. meters.

NB: A suitable layout of the plant is given in appendix.

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SECTION VII

PLANT AND MACHINERY

The main items of machinery required for the production of Microcellular soles is given in table No. 9. The total cost of plant and machinery is worked out to be Rs. 5,85,000.

TABLE 9

Sl. No.	Description of items.	No.	Price/ item.	Value Rs.
1	16"x42" mixing mill with Chilled cast iron rolls, 60 H.P. motor	1	1,48,000	1,48,000
2	Hydrolic Press size 32"x32"x4 D of capacity 100 tonnes Steam heated with 5 H.P. Hydraulic pump.	1	97,000	97,000
3.	Rubber mixing mill 12"x30" complete with chilled cast iron roll 30 H.P. Motor.	1	69,500	69,500
4	Hand fly press of size 24"x24" Steam heated.	1	9,500	9,500
5	10 KW electrical heating oven	1	10,000	10,000
6	Boiler with a capacity of 250 Kg./hr of Steam.	1	40,000	40,000
7	Transformer including wiring and installation.	1	80,000	80,000
8	Moulds for			
	(1) M. C.	6	1,500	9,000
	(2) Hawai	4	1,500	6,000
	(3) Kattai	3	1,000	3,000
9	Weigh Scales			
	(1) 100 Kg.	1	5,000	5,000
	(2) 10 Kg.	1	2,500	2,500

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	(3) 5 Kg.	1	1,500	1,500
10.	Installation 5% for items 1 to 6			20,000
	TOTAL.			5,01,000

Provision for price escalation @ 5%	25,000
Sale tax and other taxes @ 7%	35,000
Freight and transportation @ 5%	24,000
	5,85,000

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SECTION VIII

UTILITIES

(a) Water is required for cooling the mixing mill and for other personal requirements. The capital cost incurred is shown in Table No. 10a

(b) Steam

Steam is required for heating the hydraulic press and hand press. Post cure over also can be steam heated. Capital cost for a boiler of 250 S capacity is shown in table No. 9.

The operating cost of the boiler (250 Kg./hr) Rs. 20,000/year.

(c) Electrical requirements.

(1) The fixed expense for transformer and wiring and installation is shown in table No. 9.

(2) Running cost is as follows.

Table 10.

No.	Item.	KW
1	Mixing Mill (60 H.P.	45
2	Mixing Mill (30 H.P.)	22½
3	Hydraulic Press (5 H.P.)	3½
4	Post cure oven.	10
5	Lighting, fan etc.	5
6	Water pump.	2
	Total.	88

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Assuming a power factor of 0.8 and allowing a safety margin, the capacity of transformer is 150 KVA.

Total electrical requirements (per month)		35,200 K.W.H.
Electrical cost (0.18/unit)	Rs.	6,300

Hence the total operation cost per annum for utilities is

(1) For electricity		75,600
(2) For Steam.		20,000
Total.		95,600

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SECTION IX

PROCESS OF MANUFACTURE

The important steps in the manufacture of Microcellular rubber are listed and discussed below.

1. Compounding.
2. Mixing, Maturing and Prewarming.
3. Blank preparation and Moulding.
4. Post curing.
5. Inspection.
6. Finishing and packing.
7.

1) Compounding

The choice of rubber and compounding ingredients depends upon the following vulcanisate requirement.

i) Satisfactory abrasion resistence.
ii) Uniform pore structure.
iii) High, tear strength.
iv) Good flex cracking resistence.
v) Minimum shrinkage.
vi) Minimum odour.
vii) Low material cost.
viii) Easy processing.
ix) Uniform physical properties.

i) Polymer.

For the best combination of properties it is necessary to use a mixture of natural rubber and high-styrene resins

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The ratio of Natural rubber/high styrene resins depend upon the product requirement. With increasing amounts of High styrene resins ab rasion resistence, hardness and compression modulus increases, and flexibility, density, shrinkage etc. decreases.

There are two natural rubber derivatives which are suitable in the same manner as High Styrene resins, namely, graft rubber (MG 50) and cyclised rubber (CRM). Other elastomeric materials used are light coloured reclaim and cellular waste. Microcellular crumb of around 40 to 100 mesh could be used in microcellular compounds. 40 to 50 Phr would be easily mixed without much affecting the quality. Apart from lowering the cost, use of microcellular crumb offer advantages like low shrinkage light weight etc.

ii) Peptiser.

It is essential that rubber is properly broken down prior to compounding which will facilitate easier expansion. A peptiser which is active at lower temperature is recommended (ex: Renacit VII, pepton 65).

iii) Zinc oxide and Stearic acid.

The normal level of Zinc Oxide being used as activator is 4 phr and the level of stearic acid in microcellular soling is higher than conventional level of 1 to 2 phr. Because this acidic material lowers the decomposition temperature of DPT type blowing agent. Stearic acid besides its normal activation effect also ensures better distribution of blowing agent. Generally the level of Stearic acid is that of the blowing agent level in the compound.

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iv) Fillers

Keeping due consideration for the vulcanisate requirements fillers are selected as per their ability to improve (and cheapen) the compound. Because of better wear resistence silicate fillers are preferred. China clay is used as the main filler in microcellular soling and it is available at a low price.

v) Accelerator System.

Conventional.	New.
MBT/DPG	Ureka White F(~~Tertiary butyl~~)/TMT
MBTS/DPG	Santocure NS/TMT

Advantages.

(1) Higher initial delayed system, fast setting, higher expansion.

(2) Shorter curing cycle increases the production.

vi) Blowing agent.

In the manufacture of microcellular rubber organic and inorganic blowing agents are used. The most important inorganic blowing agent is Sodium bi-carbonate, though ammonium carbonate and bi-carbonate are still in use, these liberate carbon dioxide and forms cellular structure.

The most important and most commonly used blowing agent is dinitroso pentamethylene tetramine.

Properties.

1)	Specific gravity	1.43
2)	Melting Point.	198^{o}C
3)	Gas evolution	190 - 192 CC/gm.

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vii) Colours.

Generally organic colours are preferred than the inorganic types. It is desirable to include Titanium Dioxide in the recipe to obtain a desired shade.

viii) Antioxidant

A non staining type antioxidant is used Ex:- Styrenated phenol.

2) Mixing.

The mixing time is around 30 minutes. The order of mixing is mastication of rubber followed by addition of antioxidant, activators, fillers and oil . Sulphur and accelerators are added towards the last. Blowing agent is then added and properly dispersed rapidly. The stock is then sheeted out and cooled. Then it is dusted with talc and allowed to mature.

Adequate care is taken in ensuring a good dispersion of the blowing agent. If dispersion is poor, uneven pore structure will result, and if the mix contains agglomerates of blowing agent, the inevitable result is blisters in the final product.

3) Maturing.

The maturing process is usually 24 hours, It has been observed that maturing will help to get uniformity in the blowing and reduce the variation from batch to batch and within each batch.

4) Prewarming.

After 24 hours the batch is taken to the mill for prewarming. Inorder to get uniformity among batches it is advisable to blend different batches to ensure overall product uniformity. A separate

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warming mill is provided for prewarming. Prewarming mill can be used for mastication also. Sulphur addition can be conveniently done during prewarming.

5) Blank preparation.

The prewarmed stock is cut to the correct size of the mould. This ensures that the preform is of uniform diamension and weight from blank to blank so that the mould is correctly filled and wastage due to overflow or rejects due to underfilling of the mould are avoided.

6) Moulding.

(a) Moulds.

The construction of the mould is done so as to allow uninhibited expansion of the sheet immediately on release of pressure otherwise the sheet will warp and deshape. The mould frame therefore has bevelled edges so that on release of pressure the sheet pops out of frame and expands freely.

(b) Press.

Microcellular sheets can be manufactured both in hand press and hydraulic press. But in hand press the alignment of platen is never perfect and it is very difficult to get the perfect closure of moulds which is very essential for M.C. sole production. Therefore multiday light hydraulic presses are best suited for the production of M.C. sheets because:-

(i) The mould closes under positive pressure thereby ensuring perfect closure of the mould.

(ii) The pressure release and opening of the mould is quick.

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(c) Loading.

The blank is loaded into the hot mould and the mould is inserted into the press platen. The press platen is closed and heated under pressure. During the heating cycle the blowing agent decomposes to give off nitrogen and gets trapped in the rubber matrix and after cure when the pressure is released by sudden opening of mould, the precured sheets pops out and expands considerably.

The actual moulding time is 6 to 7 minutes. A small % of safety margin is allowed to prevent under cure and product rejection. When the sheet is properly cured the pressure is released, the mould is removed immediately and another mould filled with blank is inserted quickly into the press platen. The cured mould is opened, the product is removed, deflashed and deblistered and send for post cure.

7) Post curing.

Post curing is given to sheets to complete the precure. The post curing is carried out in an electrically heated oven at a temperature of about $100^{0}C$ for about 4 to 5 hrs. This operation reduces the shrinkage of the sheets on storage and increases the wear resistence of the soling.

8) Inspection and Finishing.

The post cured sheet is given for examination of visual defects, correct diamention morrect state of cure, colour uniformity moulding defect etc. and graded.

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9) Packing and Despatch.

The products are packed and labled as per orders from customers. M.C., Hawai, and Banwar sheets are seperately packed as per the class of product and despatched.

10) Banwar.

Banwar (neolite insole) is used to paste with medium hard microcellular soling for a variety of chappels and sandals. The main advantages are excellent abrasion resistence, long flex resistence coupled with appearance, feel and working characteristics of leather. Other additional advantages are resistence to moisture and mildew, and ease of fabrication ie., moulding.

Process of manufacture of Banwar is relatively simple. They are moulded in hand press and manufactured in different colours.

Waste disposal and utilisation.

Waste disposal is a problem in many industries. In microcellular sole manufacture waste can be utilised in an economical way. The main forms of waste are mould flash and scrap. Scrap can be powdered and used as microcellular crumb, which is an important filler in microcellular sole production In the case of mould flash it can be milled and reused.

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SECTION X

CAPITAL REQUIREMENTS.

A. Fixed Capital Requirement.

The total fixed capital is the sum of the expenses incurred for land and building, plant and machinery, other fixed assets and pre operative expenses. The estimated fixed capital requirement is given below.

(1)	Land and Building.	1,15,900
(2)	Plant and Machinery.	5,85,000
(3)	Other fixed assets.	28,000
(4)	Preoperative Expenses.	30,100
	Total.	7,59,000

B. Working Capital requirement.

Working Capital is the expenses incurred during a definite period of time towards the working of the plant. It depends upon the credit facilities made available by banks, raw material suppliers, and the credit term made available by the firm to the customers. Working capital includes cost of raw material, salaries and wages, utilities and other overheads.

1)	Raw material requirement (per annum)	17,26,300
2)	Wages & Salaries (per annum)	1,30,300
3)	Utilities (per annum)	95,600
4)	Other overheads.	47,550
	Total.	19,99,750
	Rounded off.	20,00,000
∴	Working Capital for 3 months.	5,00,000

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C. Total Financial Requirements.

(1)	Total Fixed Capital.	7,59,000
(2)	Working Capital.	5,00,000
	Total.	12,59,000

TABLE. X (a)

OTHER FIXED ASSETS

Sl. No.	Item.	No.	Cost.
1	Pumps and Piping.	1	7,000
2	Water tank (10,000 liters capacity)	1	6,000
3	Office furniture and Equipments.	--	10,000
4	Miscellaneous tools and tables for blank preparation.	--	5,000
	Total.		28,000

TABLE. X. (b)

PRE OPERATIVE EXPENSES (6 Months)

1	Travelling Expenses.	1,500
2	Postage, telegram, telephone.	600
3	Printing and Stationary.	1,500
4	Advertisement	500
5	Rent and Establishment	1,500
6	Miscellaneous Expenses.	1,700
7	Interest on block loan. (7½% for 6 months)	22,800
	Total.	30,100

Contd.....29

TABLE. X. (c)

OTHER OVERHEADS

1	Repairs and Maintanance of building @ 1%	1,050
2	Repairs and Maintanance of Machinery;	34,500
3	Travelling Expenses.	1,000
4	Insurance.	5,000
5	Quality control.	5,000
6	Miscellaneous.	1,000
		47,550

SECTION XI

FINANCING PLAN.

For the development of Small Scale Industries, the Government of India have launched different programmes under which Financial assistance is given at every stage from planning to production. Finance is available to the Small Scale Industries from the following sources.

(1) State Government under the State Aid to Industries Act.

(2) Kerala State Financial Corporation.

(3) State Bank of India.

(4) Commercial Banks.

Under the State aid to Industries Act, the State Government provide finance in the form of loans, guarantee for loans, raised from Banks, subscription to shares etc. The interest rate is 7%. KFC is providing financial assistance from Rs. 20,000 to Rs. 10 lakhs. The rate of interest is 7% to 9½%. Upto 100% of the working capital requirements is provided by banks. The interest is from 10% to 16%. The NSIC is operating a Hire purchase Scheme under which Indigenous and imported machines are supplied to Small enterprenures on hire purchase base.

Contd.....30

SECTION XII

PROFITABILITY ANALYSIS

A. Financing plan for the project.

(a)	Own Fund.	1,51,000
(b)	Block loan from Financial institutions.	6,08,000
(c)	Cash loan from Banks.	5,00,000
	Total.	12,59,000

B. Cost of Production.

The annual manufacturing expense involved for the Production of 150 MT of Microcellular soles and 100 MT of Hawai and 50 Tonnes of Kattai (Banwar) is estimated below.

1.	Raw material.	17,26,300
2.	Salaries and Wages.	1,30,320
3.	Utilities.	95,600
4.	Other Overheads.	47,550
5.	Interest on Working Capital. (5,00,000 @ 16%)	80,000
6.	Interest on block loan. (6,08,000 @ 7.5%)	45,600
7.	Depreciation	
	(a) Building (@ 5%)	5,250
	(b) Machinery.(@ 10%)	58,500
	(c) Other fixed assets and pre-operative Expenses(@ 10%)	5,810
	Total.	21,94,930

Contd.....31

C. Sales and Marketing Expenses.

It includes the expenditure involved in the distribution, marketing and sales of the entire products. The expense incurred the above items is given below.

1)	Distribution cost (freight, Storage, and packing at the rate of 250/MT)	75,000
2)	Marketing expenses.	6,000
i)	Salaries for sales assistant.	6,000
ii)	Commission (@ Rs.500/Ton)	1,50,000
3)	Indirect Marketing (Travel Expense Show room)	4,500
	Total.	2,35,500

D. Cost Estimation.

1)	Cost of production.	21,94,930
2)	Sales and Marketing Expenses.	2,35,500
∴	Total Cost.	24,30,430

E. Total Sales per year.

Sl. No.	Item.	Production.	Rate of Selling.	Rs.
1	M.C. Sheets.	150 Tonnes.	9.25/Kg.	13,87,500
2	Hawai	100 Tonnes.	8.25/Kg.	8,25,000
3	Banwar	50 Tonnes.	10.0/Kg.	5,00,000
		Total.		27,12,500

Contd.....32

F. Net Profit.

Total income from Sales.	27,12,500
Less cost of production and Sales and marketing Expenses.	24,30,430
∴ Profit before tax.	2,82,070
Less tax incidence (@ 30%)	94,000
Net Profit after taxation.	1,88,070

G. Rate of Return on own Capital.

Own Capital.	1,51,000
Net Profit.	1,88,070
∴ Rate of return on own Capital.	124%

H. Rate of Return on Capital employed.

Capital employed.	12,59,000
Net Profit.	1,88,070
∴ Rate of return on capital employed.	15.0%

I. Percentage Profit on sales turn over.

Annual return from sales.	27,12,500
Annual Profit.	1,88,070
% Profit on sales turn over.	7%

Contd.....33

Pay back period of borrowed funds.

The loan taken from Banks and financial institutions has to be paid back in the minimum prescribed time. Out of the total profit 25% is hold back as drawings and about 75% is used to pay back loan.

Pay back period.

Annual Profit.	1,88,070
Depreciation.	69,560
∴Available surplus.	2,57,630
Less Drawings.	52,630
	2,05,000
Amount available for paying back loan.	2,05,000
Term loan to be payed back.	6,08,000
Pay back period.	3 Years.

Contd.....34.

BREAK EVEN ANALYSIS

Break even quantity is that quantity which if produced and sold will give neither a profit nor a loss.

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

Where F = Annual fixed costs.

P = Price/ton of product.

V = Variable cost/ton.

Total sale of product.	27,12,500
∴Average price/ton of product.	9,042

The total variable cost.

i. Raw materials.	17,26,300
ii. Utilities.	95,600
iii. Direct labour.	1,00,080
iv. Distribution cost	75,000
Total.	19,96,980
∴ Variable cost/ton.	6,656

Fixed Cost. (F)

Total Cost.	24,30,430
Less Variable cost.	19,96,980
	4,33,450

Calculation

$$B.E. = \frac{F}{P-V} = \frac{433450}{2386} = 181 \text{ tonnes/annum.}$$

Cohtd.....35

CONCLUSION

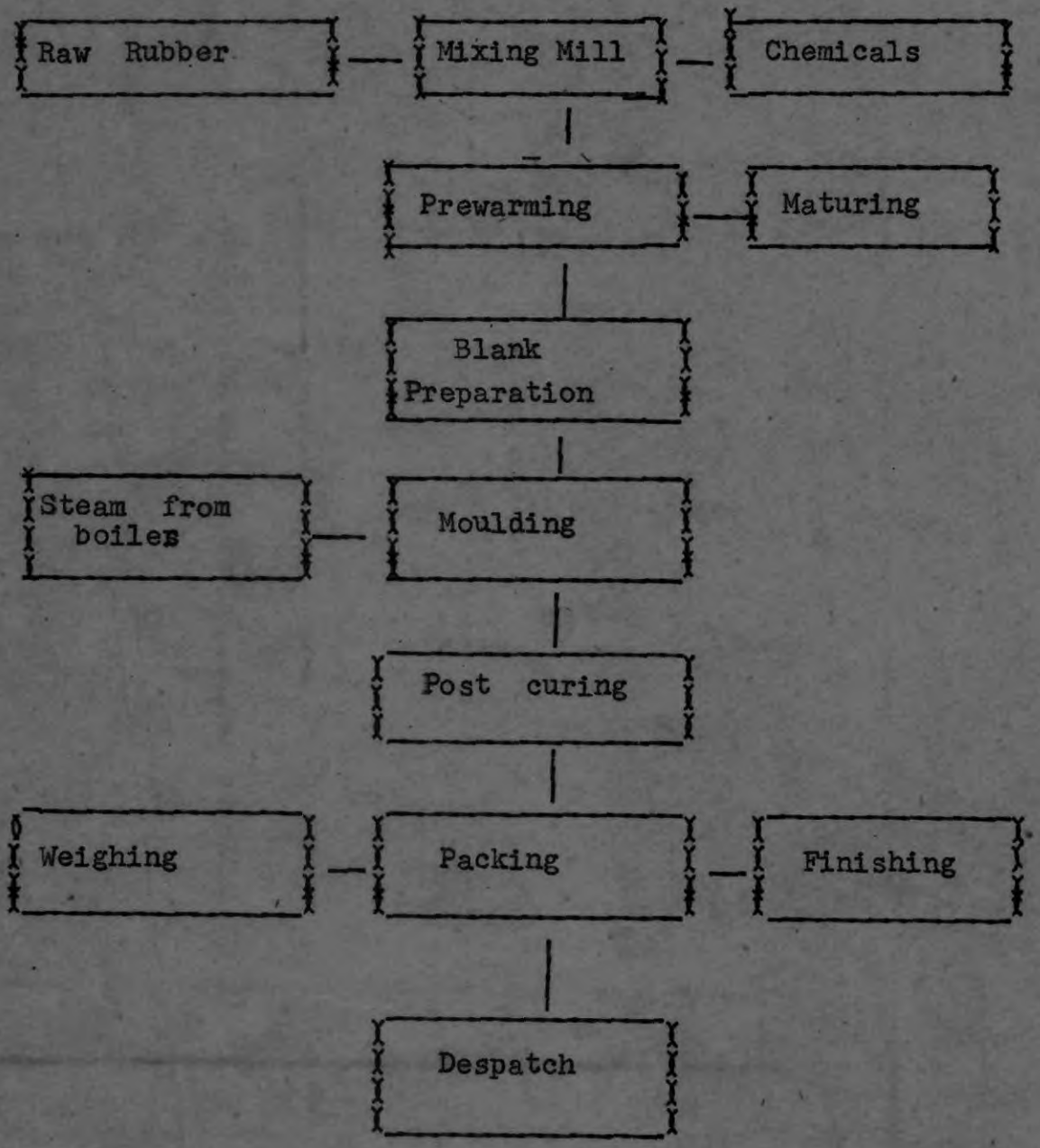
During the initial period the unit proposes to manufacture 300 Tonnes of the products in two shifts. But when the production and marketing gets stabilised it is proposed to manufacture about 450 tonnes of the products in 3 shifts per year. For this expansion programme no further additional machinery or equipment is required. Using the same basic equipments the production can be carried out. The available built up area is also sufficient for this expansion programme. Depending upon the demand for M.C. and Hawai the fixed production tonns can be changed accordingly.

Contd.....36

APPENDIX. I

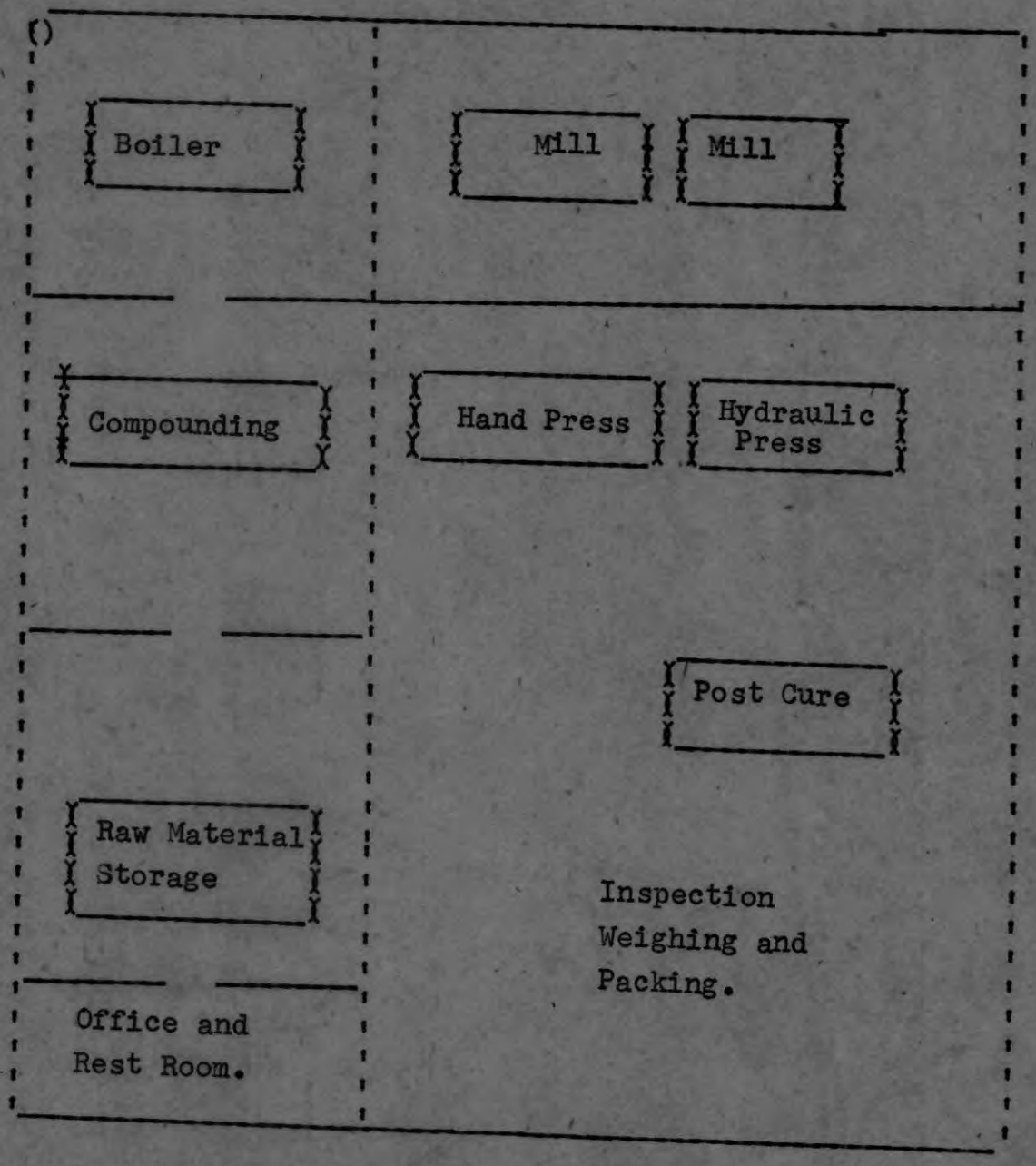
MANUFACTURE OF MICROCELLULAR SOLES

PROCESS FLOW CHART



APPENDIX. II

MICROCELLULAR SOLE PRODUCTION PLANT LAYOUT



APPENDIX. III

List of Suppliers of Raw materials and Machinery.

a) RUBBER MACHINERY.

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

ii. Kelachandra Foundry,
Chingavanam. P.O. Kottayam.

iii. Richardson & Cruddas Ltd.
Byculla Iron Works, Bombay. 8.

iv. Sohal Engineering Works,
Agra Road, Bhandup,
Bombay. 78 NB.

v. SCA Private Ltd.,
Mahalaxmi Chamber,
3rd floor, Bhulabhai Desai Road,
BOMBAY.

b) FURNACES AND OVENS.

i. Bagsvig Electronic Industries,
Vytilla, Ernakulam.

ii. Bengal-Linn (Industrial Furnaces) Ltd.,
41, Chowringhee Road,
Calcutta. 1.

iii. Shah Engineering & Equipment Co.
Kansara ~~Stre~~ Street, Bombay. 10.

c) RAW MATERIALS.

(1) Synthetic Rubber
Synthetics & Chemicals Limited,
New Great Insurance Bldg.
7, Jamshedji Tata Road,
Bombay. 1.

Contd....39

d) RUBBER CHEMICALS.

i) Alkali & Chemical Corporation of India Ltd.,
CALCUTTA.

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

iii) Mindia Chemicals Ltd.,
Wakefield House, 11 Sprott Road,
Ballard Estate,
BOMBAY. 1.

iv) Para Chemicals,
C/o. Kerala Paints Pvt. Ltd.,
Mahatma Gandhi Road,
Ernakulam, Cochin. 11.

e) SULPHUR.

i) Asiatic Chemical Co.
71, Canning Street,
Calcutta. 1.

f) PIGMENTS.

i) Colour-Chem Limited,
Fort House, 221, Dadabhoy,
Naoroji Road, Bombay. 1.

g) ZINC OXIDE.

i) Anand Chemicals,
8 Hormiman Circle, Fort,
Bombay. 1.

ii) Ashoka Chemical Products,
P-16, Kalakar Street,
Calcutta. 7.

iii) Para Chemicals,
Ernakulam-Cochin. 11.

Contd.....40

h) TITANIUM DIOXIDE.

i) Travancore Titanium Products Ltd.,
P. B. No. 64, Trivandrum.

ii) Paramount Commercial Corporation,
12-B, Fort Chambers,
Dean Lane, Fort, Bombay. 1.

i) BLOWING AGENTS.

i) Para Chemicals,
Mahatma Gandhi Road,
Ernakulam, Cochin. 11.

ii) Rishiroop Chemical Company,
Barry Market, Saddar Bazar,
Delhi. 6.

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