UNIVERSITY OF COCHIN

B. TECH. COURSE

IN RUBBER PROCESSING & TECHNOLOGY

PROJECT REPORT
ON A SMALL SCALE UNIT MANUFACTURING RUBBER HOT WATER BOTTLES IN KERALA

DISSERTATION REPORT

Submitted by:

THAMPY THOMAS B.Sc.

University Reg.No. 63

In Partial Fulfilment of

B. Tech. Degree.

16th March, 1977.

HIGH LIGHTS OF THE SCHEME

1.	Total Investment	Rs. 5,82,200
2.	Total Fixed assets	Rs. 5,01,400
3.	Land	1000 Sq.meters
4.	built up area	500 Sq.meters
5.	Working Capital	Rs. 80,800
6.	Personnel Requirements	25 Nos
7.	Annual out put	60,000 Nos
8.	B.E.Production	38,200 Units
9.	Own funds	Rs. 2,46,500
10.	Annual cost of production	Rs. 3,96,000
11.	Annual income from sales	Rs. 6,00,000
12.	Profit	Rs. 58,200

I n d e x

SECTION - A.

INTRODUCTION

A-1 Product Description and Innovation.

Rubber Products for a wide variety of uses are made by shaping uncured rubber in moulds under high pressure at elevated tempsratures. Thoso products are called "moulded goods". Moulded rubber products number into thousands, but there are a few that will serve as typical examples - hot water bags, ice bags, oil seals etc.,- Rubber Hot water bag is a pharmaceutical rubber good. This is a hollow article having a definite width, length, thickness and capacity.

This is manufactured by shaping of the compounded rubber samples in suitably designed moulds. In its simple form, a mould consists of two or three metal plates with cavities conforming to the outside shape of desired finished part. More intricate parts may require additional plates, cores, or inserts to form the desired shape and to facilitate the removal of the finished part from the mould. In principle mould-cured hot water bags can be produced using a three part mould (core release through the neck).

The rubber hot water bag consists of three components - bag, stopper holder and stopper- Through the neck of the bag, where stopper holder have to be inserted, the core of the mould is removed. The vulcanisates have to have very high tear resistance at relatively high temperatures, because the

neck of the bottle is alongated 300% when the core is removed. Hardness required for the stopper holder is higher than that of stopper.

This scheme thus helps the production of rubber hot water bags (60,000 numbers annually). These do not necessitate a high level of technical known-how and also can be easily manufactured in a small scale sector.

A2 - Evaluation of prospects.

This product find application in hospitals and houses. It is widely known that medical and public health facilities available in India at present are far from adequate. Rapid increase of population and the five year plans of the country helps to increase the number of hospitals and thus the consumption of bags. Now the doctor of population ratio is 1:1000. So the consumption of bag is large. From the simple fact that there is no unit in Kerala producing hot water bags, can be concluded that the proposed project can be started in Kerala.

SECTION - B.

MARKET SURVEY

B-1 Users/Customers Analysis.

a) Fields of application.

Main field of application is hospitals (Government as well as private sector). From the increasing population as evident from statistics; it can be seen that demand is only

Though specific information on capacity, production and demand of this as such is not available, based on performance of existing unit, it is clear that there is good demand.

(b)-Statistics.

The number of producers of the various rubber products is increasing every year. From the following available statistics it can be seen that demand for all types of rubber goods including moulded items has always been on increase.

Year	Table I Percapital consumption of rubber in India Kgs	Table 2 Rubber consumption in India M.tonnes
1962	0.14	69002
1965	0.18	94740
1967	0.19	109481
1969	0.22	131572
1971	0.23	145052
1974	0.26	172870

Reference: Indian Rubber Statistics - 1975.

The statistics on production of rubber hot water bags as such is not available. However, the consumption of rubber on end products(Table 3) is pointing that there is increase of production.

Table-3: Consumption of rubber products(including moulded and other items) other than tyres, tubes, foot wear, belting, cables, dipped goods and foam rubber, battery boxes, camel back, tread etc., and total consumption are given below:-

Year.	Consumption of other products (M.Tonnes)	Total Consumption (M.Tonnes)
1968-69	16568	128022
1969-70	16875	131104
1970-71	15991	134745
1971-72	16636	149435
1972-73	16617	152607
1973-74	21515	172007

Reference: Indian Rubber Statistics -1975.

In general the total consumption of rubber hot water bags by the Government hospitals is equal to the number of beds in the government hospitals. The number of beds in each state is given below(The statistics of government hospitals beds are only available).

Table-4 - No of beds in hospitals(State-wise)

1.	Andhra Pradesh	21706	2. Assam		5382
3.	Bihar	1082	3. Gujarat		561
4.	Haryana	512	5. Himachal Pradesh		620

7. Jammu and Kashmir	1018	8.Karnataka	28538
9. Kerala	24184	10.M.Pradesh	12020
11. Maharashtra	27025	12.Manipur	842
13. Meghalaya	1195	14.Nagaland	230
15. Orissa	8551	16.Punjab	10085
17. Rajasthan	12084	18.Sikkim	830
19. Tamil Nadu	26842	20.Tripura	960
21. Uttar Pradesh	40931	22.West Bengal	43630

Union territories:

Andaman	545	2.Arunachalpradesh	1190
3.Chandigarh	120	4.Lakshadweep	120
5.Missoram	400	6.Dadour and Nagar Haveli	75
7.Delhi	1000	8.Goa	200
9.Pondicherry	1351		

Grand Total 2,73,829 beds

The period of use of one bag is two years(maximum). The statistics of no of beds (on private sector hospitals)is not available.

There is also good export potential for this product as evidenced by following figures.

Table-5: Value of hot water bags exported-

Year	Value Rs	Year	Value Rs
1966-67	60817	1967 - 68	24829
1968-69	18590	1969- 70	44908
1970-71	46286	1971-72	25688
1972-73	..	1973-74	400957
1974-75	914416	1975-76	1279734

Reference:Monthly statistics of Foreign Trade of India.

B-2. Sales Channels and Methods.

Most of the factories are selling their products through agents and commission on sales given to agents vary from 15 to 20%.

B-3. Geographical Extent of market.

There is possibility of export of the product.

B.4. Competitive situation.

a) Domestic market:

There are 16 licensed manufacturers producing hot water bags. All are producing other moulded items along with this.

b) Export market:

Rubber Hot water bags are exported to various developed and undeveloped countries. Indian rubber products are exported to over 80 countries. There are about 100 firms in India including manufacturers and exporters engaged in exporting rubber products. With increasing awareness of Government as well as of industry to expand exports to maximum, the Government is contemplating to offer sufficient incentives by way of cash subsidy as well as by issuing import licenses against exports and giving rebate on excise duties and customs duties paid. The following table shows export statistics of bags.

Table-6. No of bags exported

Year	Numbers	Year	Numbers
1966-67	25794	1967-68	9000
1968-69	7656	1969-70	19260
1970-71	19856	1971-72	11038
1972-73	..	1973-74	136304
1974-75	259444	1975-76	320436

Reference:Monthly statistics of Foreign Trade of India.

S E C T I O N - C

PRODUCTION REQUIREMENTS:

C.1 L O C A T I O N.

When selecting alternative sites for locating the factory, three important considerations should be kept in mind (1) A factory is relatively immobile and when once constructed and /or constructed it is difficult to abandon the site. 2)The impact of plant location on operating costs and profits can be considerable. Operating costs may vary upto 25% or even 50% from one location to another.3)Building occupancy costs are both large and relatively fixed. There costs include depreciation on building and maintenance costs, taxes on land and building etc.,.

Between sites which offer comparable advantages in relation to these considerations, the choice must fall on the one which answers as closely as possible these further essential requirements.

a)Nearness to market, b)Availability of raw materials and general stores item, c)Facilities for transportation d)Availability ~~an~~ of unskilled and skilled labour e)availability of power, water and fuel and f) Satisfactory climate.

It is obvious that ideal locations answering to all these requirements will be difficult to find and therefore, in practice a compromise has to be made on the selection of the Site which offers the greatest advantage.

The selected project is proposed to locate at Kottayam in Kerala.

C-2. Raw Material Requirements.

The raw materials are common to all rubber industry. All are indigeniously available. Requirements are given in annexure II A. Total raw material price is also calculated and recorded in annexure II A. The raw materials are:-

1)Polymer:

Natural rubber is the principal polymer. It is available at Kottayam which can be called as "Rubber District of India". Price Rs. 6.00 per kg.

2)Fillers:

The main fillers used are whiting, vulcasils (precipitated Silica), Kaolin etc.,. Kaolin is another form of clay. The fillers are cheapening the product and thus making the produce viable in the market. Clay is manufactured in Kundara. Price of clay Rs. 0.40/kg
Price of whiting Rs.0.50/kg
Price of Vulcasils Rs.10/kg

3)Process aids:

Processing characteristics of the rubber is aided by process oils. The important oil used is mineral oil. Price Rs.10/- kg.

4)Other chemicals:

These include zinc oxide, Stearic acid, Accelerators, colour, Anti oxidents, etc,. Zinc oxide and Stearic acid are distributed by local dealers. Accelerators, Anti Oxi dents are manufactured and distributed by three many companies Viz Bayer(India)Limited, I.C.I., and Monsanto. All the distributors are having agents in Kerala especially in Kottayam.

Contacts are to be made with at least three firms so as to get the chemicals without delay or break. The suppliers list are shown in Appendix II.

5)Packing materials.

Polythene bags are sufficient and they are cheap.

Terms of purchase:

All negotiations are done through banks. On a margin money of 30% the bank will spend 70% for the purchase of raw materials. Amount has to be paid within 70 days with interest. For technically qualified persons 100% of the requirements of funds will be given by nationalised banks. The purchased materials will be kept in bank's godown and materials in small quantities are withdrawn whenever required.

C-3. Land, Building &Plant Layout.

a)Land.

About 1000 sq.metres is required. Possible expansion can be made by this land.

b)Building.

The built up area is estimated to be 500 sq.metres. Requirements for each section is given below.

Table-7.

Office	60 Sq.metres	Stores	40 Sq.metres
Mill room	100 " "	Boiler	48 " "
Vulcanisation	180 " "	Testing	20 " "
Godown	20 " "	Despatch & Packing	20 " "
Toilet	12 " "		
	Total 500 Sq.Metres		

Capital requirement of land and building are given in Annexure I.A.

c)Plant Layout.

The layout of the plant must obviously depend upon individual needs and requirements, the products to be manufactured, the machinary to be installed, the processes to be employed and the handling of both raw materials and finished products. It must meet the production objectives in the most economical way. Consideration of layout of plant should also be based on proposed storage capacities and their locations and handling of materials which may result. The object is to minimise handling costs, at the same time to

maintain a continuous flow of materials to avoid delay. The proposed project's plant layout is shown in the Appendix VI.

C4-Plant and Machinery.

The machinery required are:-

i) One 12"x30" mixing mill with chilled cast iron rools. Capacity 16 kgs. H.P.25; RPM-960., Reduction gear 10:1;weight 5750 kgs.

ii) One 5 daylight hydraulic press-heated with all accessories complete with power pack-having a platen size 24"x24" - 100Tons-Used for bottle curing.

iii) One steam heated, hand operated, hydraulically tested, complete with lightening - platen size 15"x15" - Used for Stopper curing.

iv) 4 steam heated, hand operated, hydraulically tested, complete with lightening - Platen size 24"x24" -used for Stopper Holder curing-.

v) Moulds of various types: 10 Moulds and 20 cores are required for bottle production, 1 Mould (having ten cavities) is required for Stopper production,4 moulds (having 5 cavities each) are required for Stopper holder production.

6. Boiler:capacity 250 Kg per hour with all accessories.
7. Pumps for cooling water, piping etc
8. One weighing balance - platform type
9. Other miscellaneous items

Quality is of Prime importance in pharmaceutical rubber items. To get good quality product, efficient testing must be done., both on raw materials and finished products. Provision is given in the project for procuring necessary laboratory equipments. The financial requirements for the machinery are shown in annexure I B. Suppliers list are shown in Appendix I.

Purchase Procedure.

The following points have to be considered in this connection.

1. Quotations are made and satisfactory quotations are confirmed. Price quoted are exclusive of tranportation, excise etc.
2. 25% of the purchase money will have to be paid in advance and remaining at the time of purchase. Payments can be negotiated through banks.
3. The purchaser has the right to inspect machinery.
4. Delivery time will be within 4 to 6 months from date of receipt of conformatory order.
5. Most machinery supplier give one year guarantee for satisfactory performance.
6. Liabilities passes on to customer immediately after despatch and shortage should be notified within one week.

C-5 Manpower requirements:

The personnel required for the unit can be catogorised under following headings.

1. Mangorial, 2) Technical, 3) Clerical and 4) Workers.

The requirement for each category is shown below:-

Table-8.

Factory personnel requirements.

1. Labourers or workers	Shift	Skilled	Un-skilled	Total
Weighing &compounding	1	2	1	3
Building&Vulcanisation	1	6	4	10
Packing	1	1	..	1
Stores	1	..	1	1
Boiler Room	1	1	..	1
Watchman	1	..	2	2
2. Supervisory/Technical	1	2	..	2
3. Clerical				
Accountant	1	1	..	1
Clerk/Typist	1	2	..	2
Store keeper	1	1	..	1
4. Manager	1	1	..	1
				25

The annual expenses for salaries and wages are given in annexure II-B.

Training Programme

For efficient running of the firm, experienced and well & trained personnel is a must. Small scale industries can't affort to have elaborate training programme, as it is a costly affair. A small industrialist can make use of the facilities provided by C.F.S.C's(Common facility Service Centres) of the State Government in this connection.

C-6 Utilities.

The utilities required are water, power for machines and lighting, steam etc.

The requirements for water, steam and power are shown below.

a)Water

Water is used in boilers, to cool mixing mill and in toilets. In Kerala water is available in all seasons. The price of 1 Kilo litre of water is 0.40 Rs.

Table-2.

Total water requirement per day

Mixing mill	10 K.L.
Boiler	1.5 K.L.
Others	1.5 K.L.
Total	13 K.L.

So annual consumption of water is 3900 K.L. The financial requirement is as shown in Annexure II C.

b)Power

Electricity is the major power for all machines. The electrical requirements for the process operations are given. The electric power required is tapped from a low tension line, since it is cheaper.

Table-10 - Electrical requirement.

Item	HP
Mixing mill	25
Boiler	5
Lighting &fans	3.5
Total	33.5

The power requirement is 33.5 H.P. This will come to about 33.5x0.746 KW = 24.99 KW

Assuming a power factor of 0.7 and allowing a safety margin, power can be tapped from Low Tension line without a transformer.

Power consumption is calculated in KWH.(Assume power factor 0.7 and one shift only working ie 8 hrs).

Table -11. Power consumption per day.

Machines	H.P.	K.WH
Mixing Mill	25	104.4
Boiler	5	20.88
Light, fan etc	3.5	14.618 KWH
Total		139.898 KWH

Annual power consumption by machines and lighting 42000 KWH.

Financial requirement is shown in Annexure II C.

c)Steam

Steam is consumed by hydraulic press and hand operated presses. Though the requirement of steam is small(about 1½ tonnes(day)), the capacity of the boiler will have to be large at least 250 kg/hr.

Annual consumption of steam will be about 450 tonnes. One litre of furnace oil is consumed for every 10 kgs of steam on an average. Hence annual requirement of furnace oil will be 45 K.L.

The financial requirement is shown in annexure II C. Total financial requirement of utilities shown in Annexure II C.

C-7. Infra-structure and other facilities.

Considerations given to the availability of basic infra-structure and supporting facilities. These aspects should be taken into account during the site selection. These include

a)Transportation for incoming raw materials as well as proutgoing finished products.

b)adequate storage facilities

c)facilities for power lines

d)Communication facilities like telephone

e)Fuel for steam and process requirement

f)water for process requirement

9)facilities for scrap disposal.

S E C T I O N - D

TECHNOLOGY OF HOT WATER BAGS MANUFACTURE.

D-1 Brief Process.

A-1(i) Mastication and compounding.

First natural rubber is masticated in a two roll mixing mill. When the rubber is banded over the roll and plasticized, Zinc Oxide and Stearic acid are added. The other chemicals are added step by step; the last ingrediant added being sulphur.

The compounding for stopper and bottle is done together and the compounding for stopper holder is done separately.

D1(ii)a Curing mould:

Use a three piece mould (core release through the neck of the bottle) for bottle production, and separate moulds for stopper and stopper holder.

It is advisable for the individual parts of the mould to be hard Chromium-plated and polished. To enable production to be carried out rationally, it is advisable to have one or two additional cores. They must however be made to fit the moulding in respect of size and design. As far as shape is concerned the ratio of the inside diameter of the neck to the maximum width of the core should be about 1:3. The surface pattern and wall thickness can be chosen as desired.

D-1(iii) Preparing the blanks.

The compound is sheeted to the desired thickness on the mill, care being taken to prevent the formation of blisters or crows feet. A liner fabric or polyethylene film should be used to make dusting of sheets unnecessary. It is advisable to load the mould with weighed blanks. Experiments should be made to find out howmmuch the blanks ought to weight

The shape and size of stopper depend on the shape and inside diameter of the neck of the bottle.

D1-(iv) Manufacture.

The mould is heated and sprayed with mould lubricant. Weighed blanks having approximately the size of the hot water bottle is placed in the mould and the mould is then closed. When the mould has been placed in the press, it is recommended to close the press under fairely low pressure. At this stage it should be checked that the individual parts of the mould fit together well and that they have not shifted in relation to one another. After this check has been made, the full pressure can be applied. It is advisable to vent the mould several times at the beginning of the cure to prevone air from being trapped.

After the cure the mould is opened and hot-water bottle, which is still on the core is removed. Since the spare core is ready, we can charge the mould immediately; when there is more than one core, the core which is about to be used should

always be heated before hand to roughly the curing temperature. Otherwise the bottle may not be cured uniformly at all places.

A special device is used to remove core from the bottle. For this purpose the neck of the bottle is stretched to about 3 times its original width. At the curing temperature the tear resistance of the rubber is reduced. It is therefore advisable to allow the bottle to cool with cold water, before it is removed.

The stopper-holder, containing a cured in thread can be fitted as follows:-

Both parts -the inside of the neck of the bottle and the outside of the stopper holder -are roughened and provided with two coats of a self curing cement. About 10 minutes should be allowed to elapse between the application of second coat and the fitting of the stopper-holder into the neck of the bottle. Before being fitted the Stopper-holder should be dipped in petrol for a short time. It should then be fitted without delay because further adjustment is not possible when petrol was evaporated.

If the diameter of the stopper-holder is slightly larger than the inside diameter of the neck of the bottle, the opening of the bottle should be turned inside out before the Stopper-holder is fitted; then the inside of the

neck and the outside of stopper holder should be prepared as above. When the stopper-holder has been fitted, the opening of the bottle should be rolled back into its normal position. The stopper-holder will then be under constant pressure, which is an advantage because it makes it practically impossible for water to seep between the bonded surfaces. The stopper is produced from the same compound as the main part of the bottle.

Typical formulations for stopper, bottle and stopper holder are given in Appendix III. The stopper holder is produced from the harder compound.

Flow chart of the process of manufacture is shown in Appendix IV.

The thickness and hardness of the bottles are tested and the bottles are packed in Polythene bags.

D-2 Quantum of production.

The expected production for the proposed project is 200 numbers per day. So the annual production is estimated to be 60000 numbers, since the working days are estimated to be 300 days. Only one type of bag having dimensions of width 8" length 15" and wall thickness 0.05" is proposed to be made in the unit.

D-3. Process Loss.

Process loss should be minimum at all levels. A process loss of 6% is accounted for in calculating the raw material cost.

Minimum process loss accounts for higher productivity.

D-4. Quality Control Measures.

Every product should have certain level of quality, worthy of its price. Certain characteristics are assigned to a product and the variation of these are indicative of its quality. This ensures product uniformity,. Quality control is necessary from raw material selection to finished product despatch. The raw materials are tested for the desired level of purity.

The finished bottles are tested according to the I.S.I. Standards. Usual tests conducted for finished bottles and stopper-holders are thickness and hardness.

I.S.I. specification is given in Appendix V. An application for I.S.I. marking should be made as soon as possible. I.S.I. mark is an insurance of quality.

S E C T I O N - E.

SELLING AND DISTRIBUTION ARRANGEMENTS.

Selling and distribution arrangements can be catogorised as (a)direct sales by opening sales depots and (b)sales through agents on commission basis.

It will be impracticable for small industrialists to open depots all over India. Products can be sold through agents and dealers and commission may vary from 15 to 20%.

The goods can be despatched through rail or lorry. Sale on credit basis is not assumed in the report and the documents for despatch of goods will be presented through banks.

S E C T I O N - F.

CAPITAL REQUIREMENT.

F-1. Fixed capital

Fixed capital is sum of expenses incurred for land, building, plant and machinary, other fixed assets and pre-operative expenses. Estimated fixed capital requirement is given in Annexure I.

Table-12.

Total fixed capital

1.Land &Building	1,46,500
2.Plant and machinery	3,08,400
3.Other fixed assets	23,000
4.Pre-operative expenses	23,500
Total	5,01,400

F-2. Working capital.

Working capital is expenses incurred during a definite period of time towards working of plant. This is dependant on the time taken for realisation of the sales value. Usually Working Capital is calculated for 3 months. It comprises of raw material cost, salaries and wages, utilities cost and other expenses as repairs and maintenance cost etc.,.

Table -13.

Working capital requirements per annum	
1. Raw materials	1,38,700.00
2. Salaries and Wages	1,03,500.00
3.Utilities	58,400.00
4. Other expenses	22,700.00
Total	3,23,300.00
Working capital for 3 months	80,825.00
Rounded off	80,800.00

Details are shown in Annexure II.

F-3. Total Financial requirement.

This is the summation of total fixed capital and Working Capital.

Table - 14.

Total fixed capital	5,01,400.00
Total working capital for three months	80,800.00
Total	5,82,200.00

This is shown in Annexure IV.

SECTION-G.

FINANCING PLAN.

In India, an entrepreneur need contribute only a minor portion of total capital for starting small scale industry. There are a number of institutions in India for helping the entrepreneur namely I.D.B.I.(Industrial Development Bank of India); U.T.I.(Unit Trust of India), S.I.D.C.(Small Industries Development Corporation) and S.F.C.(State Financial Corporation

For the present project financing plan is as follows:-

100% of Ex-Factory price of machinery is taken from Kerala Financial Corporation against hypothecation of machinery. Working capital is taken as loan from banks. Rest is own funds.

Table-15.

Term loan from K.F.C.	2,54,900.00
From Banks	80,800.00
Total Borrowings	3,35,700.00
Own funds	2,46,500.00
Total	5,82,200.00

All machines are indigeneously available, so there is no need of foreign exchange.

Conditions of the payments, advances and repayments of Term Loans in respect of certain institutions are given below.

Sources of Financial Aids are following.

1. S.F.C.

They grant loans from 10,000 to 10,00,000 to any single concern. They provide 100% of machinery cost, 75% of building cost and 40% of Working Capital at 7.5% interest. Repayment starts only after 2 years and should be complete within 10 years thereafter.

2.Kerala State Small Industries Corporation.

Provides Hire Purchase fascilities for machinery upto 10 lakhs of rupees on a margin money deposit of 20% (10% for technically qualified but unemployed). The interest is 7½%. Repayment starts after 2 years and should be complete within 7 years.

3.U.T.I.

The U.T.I. aims at the mobilisation of monetary resources of nation, mainly from middle income group and to raise capital for nation building activities, mostly as industrial capital.

4.Commercial Banks.

Nationalised banks provide loans formachinery on 25% margin money and 12% interest. Pay back period is 3 years and monthly repayment starts from the third month. For Working Capital any amount can be drawn.

5. National Small Scale Industries Corporation,New-Delhi.

Hire Purchase facilities are available for both indegeneous and imported machineries. Interest is 7.5% with a pay back period of 7½ years.

6. Industrial Development Bank of India.

With a view to further streamline the availability of credit to industrial development and to give more freedom of action to the credit giving agency, the Reserve Bank has a wholly owed subsidiary under the name the I.D.B.I. The Bank is authorised to give all types of financial assistance to directly to industries or to other banks and institutions which in turn help the industries. Thus if a bank loan is re-discounted with I.D.B.I., the interest rate may fall from 15 to 10½%.

SECTION - H

PRICING POLICY.

With regard to price to unit can market the product at the prevalant prices in the market. Most of the leading manufacturers have only one price. The price should be competitive in the market and should as far as possible be comparable to the prices prevailing for this product.

The present project is worked out with an average retail price of Rs.10/Unit.

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SECTION - I.

PROFITABILITY ANALYSIS

Financial viability of the project can be guaged through profitability. Followings are examined in this connection.

a) Rate of return on Own Capital.

Own Capital	2,46,500
Net Profit	58,200

Rate of return on Own Capital 23.61%

b) Rate of Return on capital employed.

Fixed plus Working Capital	5,82,200
Net profit	58,200

Rate of return on capital employed - 9.997%

c) Percentage Profit on Sales Turnover.

Receipts from sales	6,00,000
Annual profit	58,200

Percentage profit on sales turnover - 9.7%

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SECTION - J.

ECONOMIC VIABILITY.

J-1. Interest commitments.

8% interest on Term Loan from K.F.C.	20,392
16% interest on Working Capital from Banks	12,928
	33,320

So total interest commitments is calculated to be 33,300/-.

J-2. Pay back period.

Term loan has to be paid back within prescribed time. The pay back period is to be kept at minimum time possible to save the interest to be paid year after year. Since part of money is paid back in first year, the ability to pay back borrowings will be more due to decrease in interest commitments.

Depreciation per annum is calculated and shown in Annexure V-I.

Table-16.

a) Net Profit	58,200
b) Depreciation	39,400
c) Available surplus (a plus b)	97,600
d) Less drawings	12,634
e) Amount for repayment	84,966
f) Term loan to be paid back	2,54,900
g) Pay back period	3 Years.

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Break Even Analysis (J-3).

Break even quantity is that quantity if produced and sold will give neither a profit nor a loss. Break Even Point is calculated using the following formula.

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

where F = Annual Fixed Costs(not varying in proportion to volume of production. Eg. Depreciation, Interest of fixed investments, Managers and others salary, other expenses for W/C etc.,.)

P = Price/Unit

V = Variable cost/Unit(Varying directly with volume of production, eg.direct labour, direct materials, utilities etc.,.)

P - V = Contribution

Table-17(Annual fixed cost for production)

Depreciation per annum		39,400
Interest per annum		33,300
Other overheads of W/C		21,700
Salaries		52,440
	Total	1,46,840

Table-18.(Variable costs for production).

Raw material costs		1,38,700
Wages		51,060
Other utilities		59,400
	Total	2,49,160

Total units of production = 60,000

Variable cost/Unit 2,49,160/60,000 = 4.153 = V.

Selling price per unit 4,79,100/60,000 = 7.985 = P.

Contribution 7.985-4.153 = 3.832

B.E.Production = Fixed Cost of production/Contribution

$$\frac{1,46,840}{3.832} = 38,200 \text{ Units}$$

S E C T I O N - K.

SOCIAL BENEFITS

Rubber Hot Water Bags production can be started as a small scale industry with indigenous raw materials and machinery. In the larger perspective of natural development also, the entirepreneur is doing a good job by managing the project. To the society it provides followsings:-

a) Offers employment for 25 persons

b) To the nation it earns Foreign Exchange through Exports

It also provides personal benefits to the entrepreneur.

ACKNOWLEDGMENT

My thanks and gratitude are due to several persons who helped me in my endeavour. I would like to express my thanks to Mr.O.U.George, Accounts Officer, M/s C.M.George and E.V.Thomas, Deputy Directors, and Mr.M.K.Balagopalan Nair, Chemical Engineer, Rubber Board for their guidance in prepairing the report.

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ANNEXURE S.

Annexure -I. Fixed Assets -Capital Requirement.

ANNEXURE I-A LAND &BUILDING

1. 1000 sq.meter at Rs.7.50/meter(sq)	Rs.	7,500.00
2. Site Levelling, drainage, road etc.	Rs.	2,000.00
3. Cost of 500 sq.meter of built up area at Rs.250/sq.meter	Rs.	1,25,000.00
4. Over head Tank (10000 litres)	Rs.	12,000.00
Total	Rs.	1,46,500.00

ANNEXURE I-B - PLANT AND MACHINERY.

		Rs.ps
1.Mixing mill 12"30" with all accessories	1	75,000/-
2.Hydraulic press 5 daylight 24"x24" platon size with power pack	1	64,200/-
3.Steam heated hand operated press 15"x15"	1	800/-
4. " " " " 24"x24" at Rs.2800/-each	4	11,200/-
5.Moulds of various types	1	50,000/-
6.Boiler -250kg/hr with accessories	1	45,000/-
7.Pump for cooling water,piping etc.	1	5,000/-
8.Weighing balance planton type	1	1,200/-
9.Other miscellaneous items		2,500/-
Total		2,84,900/-
Transportation &Freight 3%		7,647/-
Erection and installation 5%		12,745/-
Provision for price escalation 5%		12,745/-
Sales tax and other taxes 8%		20,392/-
Total		3,08,424/-

Rounded off Rs. 3,08,400/-

Annexure -I-C Other fixed Assets:

1.	Office furniture and equipment	Rs. 3000
2.	Laboratory equipments	
	a)Thickness guage	700
	b)Hardness Tester	800
	c)Other Lab.items for chemical testing	18,000
3.	Miscellaneous	2,500
	Total	Rs. 23,000

ANNEXURE I-D PRE-OPERATIVE EXPENSES.

1.	Travelling expenses	Rs. 1,000
2.	Postage Telegram and Telephone	500
3.	Printing &Stationery	500
4.	Advertisement	1,000
5.	Rent and Establishment	1,000
6.	Legal charges	100
7.	Interest on block loans (Rs.4.2 lakhs taken at 9% interest for six months)	18,900
8.	Miscellaneous	500
	Total	Rs 23,500

ANNEXURE I-E.TOTAL FIXED CAPITAL

1.	Land &Building	Rs. 1,46,500
2.	Plant &Machinery	3,08,400
3.	Other fixed assets	23,000
4.	Pre-operative expenses	23,500
	Total	Rs 5,01,400

ANNEXURE-II

WORKING CAPITAL REQUIREMENTS

Annexure II-A Raw Materials Requirement per Annum:

(Prices quoted are including transporting charges)

Sl.no.	Material	Price/Kg Rs.	Quantity (kg)	Total costs Rs.
1.	Natural Rubber	6.00	12220	73,320
2.	Stearic acid	10.00	62	620
3.	Zinc oxide	16.00	1225	19,600
4.	whiting	0.50	9200	4,600
5.	Sulphur	2.00	170	340
6.	Vulcasit F	35.53	145	5,147
7.	Vulcasit Thiuram	29.54	26	767
8.	Precipated Silica	10.00	440	4,400
9.	Kaolin	0.40	1100	440
10.	Dyestuff	120.00	22	2,640
11.	Rosin	5.60	55	308
12.	Mineral Oil	10.00	110	1,100
13.	Anti-Oxident(Ø)DOD	40.00	80	3,200
14.	Titanium dioxide	13.00	505	6,565
15.	Fast yellow	110.00	92	10,120
16.	Fast red	150.00	30	4,500
17.	Packing materials &lubricants			1,000
	Total		25482	1,38,667
	Rounded off			1,38,700

ANNEXURE II B MAN POWER REQUIREMENT

Sl.No.	Catogory	Number/day	Cost/month Rs.	Annual expense Rs.
1.	Manager	1	1000	12,000
2.	Chemist/Rubber Technologist	1	900	10,800
3.	Foreman/Supervisor	1	500	6,000
4.	Clerk/Typist	2	350x2	8,400
5.	Store Keeper	1	350	4,200
6.	Accountant	1	350	4,200
7.	Skilled workers	10	250x10	30,000
8.	Unskilled workers	6	150x6	10,800
9.	Peon/Watchman	2	150x2	3,600
	Total	25		90,000
	Add 15% G.P.F.&other benefits			13,500
			Total	1,03,500

ANNEXURE II C WORKING EXPENSES ON UTILITIES

1. 42000 KWH of power Rs.0.15/Unit	Rs. 6,300
2. Water 3900 K.L./Annum Rs.0.40/K.L.	Rs. 1,340
3. 46 K.L. of Furnace Oil for steam (Rs.1.10/litre)	Rs. 49,500
4. Transportation of Fuel(Rs.0.05/litre)	Rs. 2,250
Total	Rs.59,390
Rounded off	Rs. 59,400

ANNEXURE II D OTHER OVERHEADS

1.	Repairs and Maintenance on 1% of building and land	Rs.	1,465
2.	Repairs and Maintenance on 5% of machinery		12,745
3.	Travelling and advertisement		500
4.	Printing and Stationery		500
5.	Postage and Telephone		500
6.	Insurance (1% of total fixed capital)		5,014
7.	Audit fee and legal charges		500
8.	Miscellaneous		500
	Total	Rs.	21,724
	Rounded off	Rs.	21,700

ANNEXURE II E TOTAL WORKING EXPENSES PER ANNUM

1.	Raw Materials	Rs.	1,38,700
2.	Salaries & Wages		1,03,500
3.	Utilities		59,400
4.	Other overheads		21,700
	Total	Rs.	3,23,300
ie.	Working capital for three months		80,825
	Rounded off	Rs.	80,800

ANNEXURE III TOTAL CAPITAL REQUIREMENTS

1.	Total fixed capital	5,01,400
2.	Three months Working capital	80,800
	Total Rs.	5,82,200

ANNEXURE IV
FINANCING PLAN.

Term loan from K.F.C.	Rs. 2,54,900
Loan from banks -Working capital for three months	80,800
Total borrowings	Rs. 3,35,700
Own funds	Rs. 2,46,500
Total	Rs. 5,82,200

ANNEXURE V - I.
DEPRECIATION PER ANNUM.

Depreciation on machinery	10%	Rs. 30,840
2. Depreciation on building	5%	6,250
3. Depreciation on other fixed assets	10%	2,300
	Total	Rs. 39,390
	Rounded off	Rs. 39,400

ANNEXURE V- 2

1. INTEREST PER ANNUM

1. Interest on term loan for machinery from K.F.C.@8% level	Rs. 20,392
2. Interest on Working capital at 16%	Rs. 12,928
Total	Rs. 33,320
Rounded off	Rs. 33,300

ANNEXURE VI

ANNUAL COST OF PRODUCTION

Total working expenses per annum	Rs.	3,23,300
Total depreciation		39,400
Total interest commitments		33,300
Total	Rs.	3,96,000

ANNEXURE VII

ANNUAL SALES AND PROFIT

Total Sales (200x300x10)	Rs.	6,00,000.00
Less:		
20% Commission		1,20,000.00
		4,80,000.00
Less:		
Transportation charges Rs.15/1000 Nos		900.00
Total Selling Price	Rs.	4,79,100.00
Less:		
Annual cost of production	Rs.	3,96,000.00
Gross Profit	Rs.	83,100.00
Less:		
30% Tax incidence		24,930.00
Net Profit	Rs.	58,170.00
Rounded off	Rs.	58,200.00

ANNEXURE - VII

PROFITABILITY

Net Profit Rs. 58,200

A. Own capital	Rs. 2,46,500
Rate of return on own capital	23.61%
B. ~~Perce~~- Total capital employed	Rs. 5,82,200
Percentage profit on capital employed	10%
C. Annual return on sales	Rs. 6,00,000
Percentage profit on sales turnover	9.7%
D. Total fixed capital	Rs. 5,01,400
Percentage profit on fixed assets	11.61%
E. Total Working capital for three months	Rs. 80,800
Percentage profit on Working Capital	72.03%

ANNEXURE - IX

PAY BACK PERIOD AND BREAK EVEN PRODUCTION

a) Annual Profit	Rs. 58,200
b) Depreciation	39,400
c) Available surplus (a plus b)	Rs. 97,600
d) Less: Drawings	12,634
e) Amount for repayment	Rs. 84,966
f) Term Loan to be paid back	Rs. 2,54,900
g) Pay back period f/e	Three Years
h) Break Even Production	38,200 Units

APPENDIX - I

Suppliers of Rubber Machinery:

1. M/s Richardson & Cruddas Ltd,
   Byculla Iron Works, P.B.No.4503,
   Bombay.

2. M/s Sohal Engineering Works,
   Lal Bahadur Sastri Marg, Bhandup,
   Bombay-78.

APPENDIX II.

Suppliers of Rw materials.

Stearic acid	i)	M/s Godoreg Soaps Pvt Ltd., Eastor Express Highway, Vikhroli, Bombay-79.
	ii)	M/s Modi Enterprises Ltd, Modinagar, Uttar Pradesh.
Zinc Oxide	i)	M/s Associated Pigments Ltd., 14-Netaji Subash Road, Calcutta
	ii)	M/s Pigments and Chemical Prdducts, 10, Armenian Street, Calcutta.
Pigments & Fillers	i)	M/s Indoken Pvt Ltd., Fort House, 221 D.N.Road, Bombay-1
	ii)	M/s Kilachand Devachand Co.Pvt.Ltd., Rubber Division, 7, Jamshedji Tata Road, Bombay-20
Plasticizers &Oils	i)	M/s Indo Nippon Chemical Co.Ltd., Alico Building, Dr.Dadabhai Naoroji Road, Bombay.
	ii)	M/s Esso Standard Co., P.O.181, Bombay-20.
Other Chemicals	i)	M/s Alkali Chemical Corporation of India, Rishra, West Bengal.
	ii)	M/s Monsanto Chemicals of India Pvt.Ltd, Bombay-1.
	iii)	M/s Bayer(India)Limited, Rubber Dn, P.O.Box No. 11110, Bombay-20.

A P P E N D I X III

Typical Formulations.

	Stopper & Bottle phr	Stopper Holder
RMA 1X	100	100
Stearic acid	0.5	0.5
Zinc Oxide	10	10
Whiting	70	100
Sulphur	1.2	2.25
Vulcasit F	1.2	1
Vulcasit Thiuram	0.2	0.25
AO(DOD)	0.8	..
Vulcasil S	..	20
Kaolin	..	50
Dyestuff	..	1
Titanium dioxide	5	..
Rosin	..	2.5
Mineral Oil	..	6
Fast yellow	0.9	..
Fast Red	0.3	..
	190.10	292.50
Cure	12' at 152°C	Cure at 143°C 30'

AO(DOD) - Antioxidant 4,4' dihydroxy diphenyl

Vulcasit F - Combination of dibenzothiazil disulphide and basic accolorators

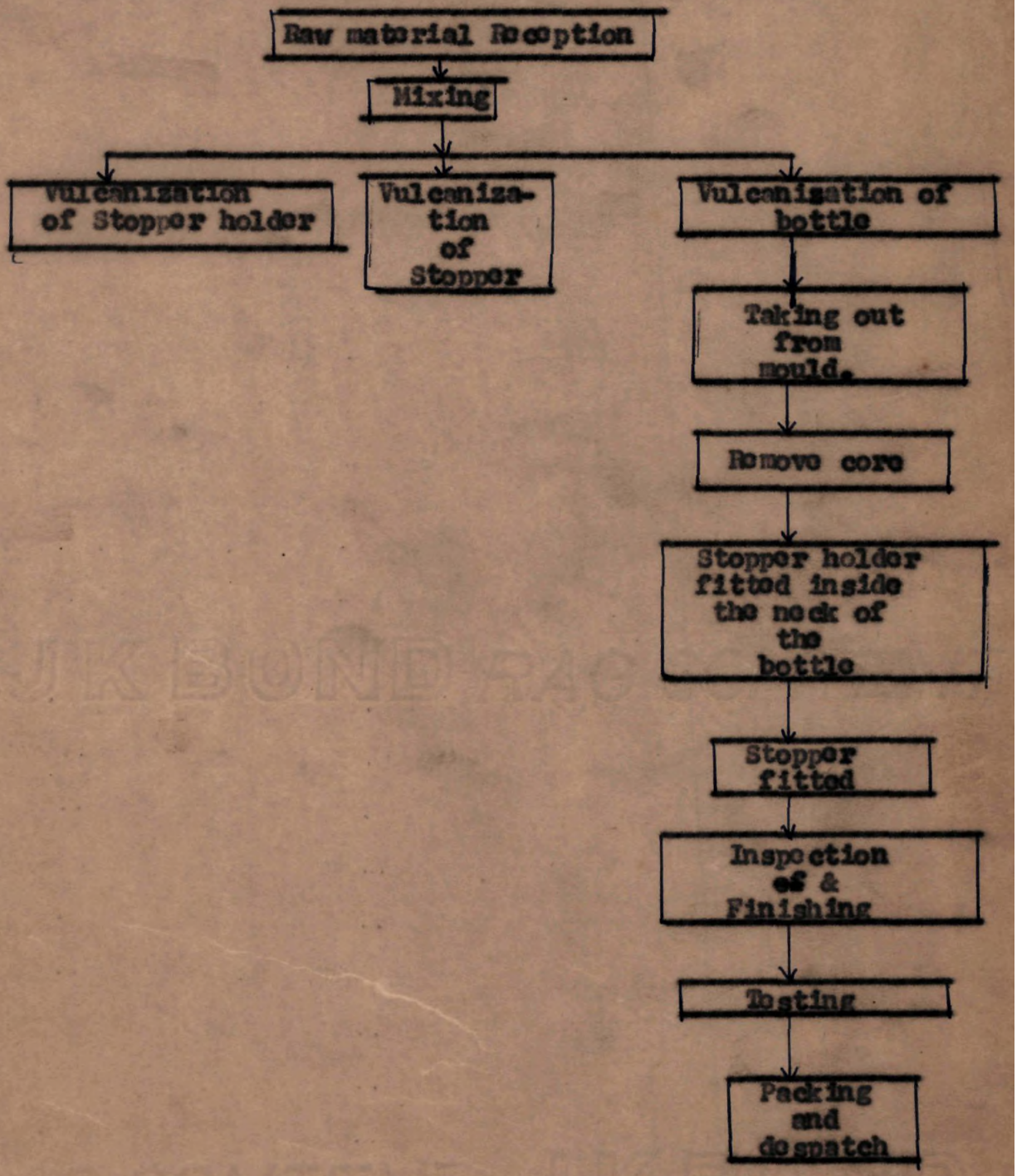
Vulcasit Thiuram - TMTD

Vulcasil S - Precipitated Silica

Kaolin - Another form of clay

APPENDIX IV

PRODUCTION OF RUBBER HOT WATER BAGS -FLOW SHEET



APPENDIX V

LIST OF I.S.I. SPECIFICATION ON RUBBER HOT WATER BAGS.

INDIAN STANDARDS IS1367 -1975

APPENDIX VI

PLANT LAYOUT